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"INTERNATIONAL ASPECTS OF THE NITRATE SITUATION"

BOSTON UNIVERSITY

College of Business Administration

THESIS

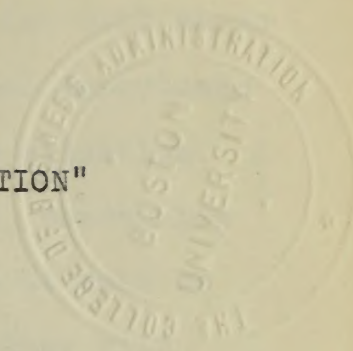
by

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(B.S. in B.A. certificate Boston University 1933)

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the degree of

MASTER OF BUSINESS ADMINISTRATION

1934



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INTRODUCTION

This work is not a chemical dissertation; rather it is an attempt to compile and present data which will serve to impress upon the minds of readers the vital importance of the economic aspects of the world nitrate situation. A few chemical terms must of necessity be used, especially in the description of certain processes; but it must be clearly understood that all such terms, together with whatever discussion they may necessitate, are to be subordinated to the principal theme, which is economic.

For non-technical readers, a brief definition of the term NITRATES might be apropos. Chemically speaking, nitrates consist of the salts and esters of nitric acid. Both the salts and the esters are formed by the replacement of the acid hydrogen of the acid; salts resulting when it is replaced by a metal or metal-like radical, and esters resulting when the replacement is by a hydro-carbon radical. When the procedure is reversed, nitric acid is produced from the nitrates.

The importance of nitric acid in modern industrial chemistry is well-recognized; thus we may easily see the economic importance of proper control and development of world supplies of nitrates. But nitric acid itself is not the only, nor even the best-known, product made from nitrates. The number of such products is legion; some of the most important will later be described in detail.

Perhaps the most important uses for nitrates are in the manufacture of fertilizers and explosives; at least, these are the best-known uses. It is with these two industries in mind that modern commercial and industrial world powers are constantly vying with each other in the production and control of nitrates. It is this constant international competition for superiority and self-sufficiency of production that has resulted in the current state of over-production and low prices throughout the world. Productive capacity in this industry is not limited or controlled to any great extent by the economic law of supply and demand; each nation wishes to produce an amount equal to its own requirements, so that in case of war it will not be dependent upon other countries for ingredients of explosives. This desire for self-sufficiency has resulted in an exportable surplus in practically every producing nation, due to the fact that peacetime requirements are but a fraction of the war-time amounts for which plant capacity exists at present.

The international aspects of the nitrate situation have changed very radically since 1914. Prior to that year, natural Chilean saltpeter was practically the only commercial source of nitrates. With the disrupting of ocean communication during the War, and with the desires of the powers to have their own sources of nitrates near at hand, the sensational rise of synthetic nitrogen products began to take place. This rise has been so rapid in relation to world consumption of nitrogen products that at present the Chilean fields produce only a small part of

the annual world consumption. Chile's share in world production seems to be decreasing year by year.

World competition in this field has of late become so keen that during the past few years there have been formed several international agreements creating associations of the cartel type. The aim of these associations has been to control either the price or the volume of production, or both. They have met with varying degrees of success, as will be explained in the thesis proper.

A diversified means of approach had of necessity to be adopted in the preparation of this thesis, as I could find no single report or source that would cover the entire scope of the report. Different phases of the problem have been previously covered in full by others, but for information as to the present international situation I had to rely upon current periodicals. A veritable mine of such information was found in the OIL , PAINT AND DRUG REPORTER, a trade weekly. It is of course quite natural to find that no previous study had adequately covered this exact field; if such a study had been made, the present thesis would have been superfluous.

Part I of the thesis will discuss the various uses of nitrates, as well as the various types of nitrogenous materials that are used for the different purposes. Such uses will as far as possible be traced back to show their historical developement. It will be shown how men of different nationalities have combined their research knowledge

The second major consideration is the fact that the information is being provided to the public. It is not sufficient to simply provide the information to the public, but it must be provided in a manner that is understandable and useful to the public.

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in these fields to further the advancement of our world civilization. The men of no one country were responsible for the entire fund of knowledge in any particular field; such advancement as was made was on an international basis.

Part II will discuss the present international situation of supply and demand in the nitrate field. It will show how since 1914 the trend has been away from Chile as the source of supply for the world demand; it will further attempt to show the reasons, both economic and political, for this change in the trend. Also in this section will be discussed the results of this change in trend, as well as the results of the present condition of over-production.

Part III will consist of an attempt to forecast the future of the industry. There are at present two opposing factors in the industry: the political, which desires economic self-sufficiency for all great powers, with war-time capacity in each; and the economic, where reason dictates that productive capacity must of necessity be reduced, in order to bring the supply back into a normal relationship with the demand. Any forecast for this industry must of necessity be a forecast as to which of the two factors will in the end dominate the other---the economic, or the political.

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REPORT ON THE PROGRESS OF AGRICULTURE

REPORT OF THE SECRETARY OF AGRICULTURE

PRESENTED TO THE HOUSE OF REPRESENTATIVES

IN THE YEAR 1891

By order of the House of Representatives

WASHINGTON: GOVERNMENT PRINTING OFFICE: 1891

PART I

USES OF NITRATES

THE USES OF NITRATES IN AGRICULTURE

THE NITRATE OF SODIUM, OR CHILEAN SALTPETER, IS ONE OF THE MOST IMPORTANT OF THE NITRATES. IT IS USED IN THE MANUFACTURE OF EXPLOSIVES, AND IN THE TREATMENT OF WOUNDS. IT IS ALSO USED IN THE MANUFACTURE OF GLASS, AND IN THE TREATMENT OF METALS.

WASHINGTON: GOVERNMENT PRINTING OFFICE: 1891

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SECTION A---FERTILIZERS

HISTORY OF USE---MAJOR INVESTIGATIONS

EARLIEST WORK IN ENGLAND, 1660:

Up until 1660 the use of nitrates as fertilizers was absolutely unknown. In that year an English nobleman made experiments with a solution of saltpeter in water. He found that a corn crop fertilized with this mixture, even though planted in seemingly barren ground, yielded a greater harvest than a similar crop, unfertilized, which was planted in much better ground. This experiment, even though of great practical importance, could not be the basis for any extensive research, due to the lack of knowledge that existed at that time of both the structure of plants and of the principles of chemistry. However, it showed that people were beginning to awaken to the possibility of enriching their ground so as to enable the same plot of land to produce greater crops.

WORK OF DE SAUSSURE (FRANCE), 1804:

The work of the French chemist Théodore de Saussure presented the world with the first real light upon the subject of fertilization of plants by means of nitrates. It was de Saussure who first realized the significance of the ash ingredient of plants, and that plant life was not possible without such ingredients. He further showed that it was only the ash of plants which was gotten from the soil. Certain contemporary authors had contended that

because mineral substances were present in plants in only very minute quantities, such substances were necessary to the life of the plants. De Saussure refuted that statement in his investigations.(1)

VON LIEBIG IN ENGLAND:

The reports of Justus von Liebig to the British Association in 1840 and 1842 were destined to establish the foundation of the modern chemical fertilizer industry. He was the first person to present to the English the importance of having soluble mineral substances in the soil. Von Liebig also sought to impress upon English minds the value of the use of nitrogen for fertilizing crops.

(1) The following quotations from de Saussure will serve to show his method of reasoning. Quoted from the original French: p262: "Plusieurs auteurs ont admis que les substances minérales qu'on trouve dans les végétaux, n'y sont qu'accidentelles, y nullement nécessaires à leur existence; parce qu'ils ne les contiennent qu'en tres-petite quantité. Cette opinion ... n'est point démontrée. Leur petite quantité n'est pas un indice de leur inutilité ... Mais l'observation ... prouve que plusieurs plantes requièrent un aliment salin, mais qu'il doit être modifié dans sa quantité et dans ses principes, suivant la nature du végétal qui doit l'absorber." p270: "Les racines des plantes absorbent les sels et les extraits, mais en moins grande raison que l'eau qui tient ces sels et ces extraits en dissolution.... Un végétal n'absorbe pas en même proportion toutes les substances contenues à la-fois dans une même dissolution; il en fait des sécrétions particulières; il absorbe en général, en plus grande quantité, les substances dont les solutions séparées sont moins visqueuses." p280: "L'analyse démontre que tous les principes dominants dans les cendres, sont contenus dans le terreau, et que sa partie soluble, pénètre seule dans le végétal, contient ces principes en plus grande proportion, que la partie insoluble... Leur existence, dans la plante, n'a rien donc que de naturel, et leur absence y serait bien plus digne d'étonnement."---de Saussure, "Recherches Chimiques Sur La Végétation".---1804, Paris.

The more important conclusions of von Liebig are as follows:

"Plants invariably contain a certain number of mineral substances, and, in fact, always the same substances; the nature and quality, or the varying proportions of which are ascertained by finding the composition of the ashes of the plants. The mineral substances found in the ashes were originally ingredients of the soil, all fertile soils containing a certain amount of them; they are never wanting in any soil in which plants thrive."

"It is therefore certain, that one of the conditions of fertility in a soil is the presence in it of certain mineral constituents."

"Animal manure not only supplies the plants with a certain amount of their mineral and atmospheric food, but also provides them, in carbolic acid and ammoniacal salts, those substances which are the most indispensable for the introduction into the vegetable organism of the mineral constituents which by themselves are insoluble in water."

"If the soil is to retain permanently its fertility, the mineral constituents removed in the crops must be restored to it from time to time, at shorter or longer intervals, or, in other words, the original composition of the soil must be restored."

"If, during the formation of the leaves and roots, two plants of the same kind are supplied with unequal amounts of food in the same time, their increase in mass is unequal. It is greater in that plant which in that time received more food: its development is accelerated. The same inequality in mass is observed, when the same food is applied to both plants in equal quantity, but in different conditions of solubility... The conditions which shorten the time required for its growth are the same as those which determine its increase in mass."(2)

PROGRESS IN AMERICA SINCE WORLD WAR:

The United States Department of Agriculture is constantly making field tests of various fertilizers in different parts of the country. It wishes to find out which fertilizers are best for specific crops, and which concen-

(2) Justus von Liebig---"Principles of Agricultural Chemistry"---1855---pp 17, 18, 21, 27, 29.

tration gives the best results in each case. Such experiments will serve to increase the quality of our crops, as well as their quantity, thus giving them a more favorable place in the markets at home and abroad.

Since the War there has come about in this country, as well as in the rest of the world, an increase in the concentration of commercial fertilizers. This movement has been sponsored primarily by the United States Bureau of Soils. Formerly many commercial fertilizers had food content of not greater than 12%, but those times are past. The change in this regard has been brought about by the increase in freight rates and by the increase in storage charges since the War. It is no longer profitable to manufacture and ship fertilizers of low food content; all shipments must have as great value as possible in the smallest bulk.

Another movement in the same direction has been the standardization of grades of fertilizers. The year 1923 marked the culmination of this campaign. The movement was supported both by the fertilizer industry and by the agricultural colleges and experimental stations. The leading manufacturers and practically all of the states using fertilizer agreed upon some thirty standard fertilizers, which it was believed would satisfy most requirements. The new standard fertilizers were found to be more efficient and economical than the multitude of brands formerly employed by agriculturists. (3)

(3) "New International Yearbook" for 1923---"Fertilizers".

KINDS OF NITRATES USED AS FERTILIZERS

NATURAL NITRATES:

GUANO: This fertilizer material is composed of the excrement of sea fowl, and is much prized because of its high nitrogenous content. The greatest supply comes from a chain of very dry islands off the coast of Perú. Dry climates are needed for commercial exploitation of this type of manure; the least trace of rainfall or other dampness in the air will tend to wash much of the mineral matter from the guano. In this respect the climate of the Peruvian islands is ideal; rainfall is there an unknown quantity.

Fish-guano, while it has some manufacturing done to it, is practically a natural manure. It is prepared by pressing, drying and pulverizing the heads of fish. This fertilizer has practically the same amount of nitrogen in the form of ammonia as has the Peruvian guano---about 10%.

CHILE SALTPETER: This substance, nitrate of soda, was for many years the chief world source of nitrogen for commercial purposes. As the name indicates, the main deposits are to be found in Chile, although there is a small quantity in the neighboring portions of Perú and Bolivia.

Early in 1929 there were reports in newspapers of South Africa of deposits of nitrate of soda being found in the Gibeon district. These reports were later confirmed. An outline was made of deposits covering 10,000 square miles, and proclamations were issued to include 32,000

square miles in the nitrate area. These proclamations also prohibited all further prospecting. The deposits were said to contain about 16% nitrate of soda. (4)

There are some deposits of nitrate of soda here in the United States, but they are not of commercial importance. The Geological Survey Bulletins numbers 820 and 838 serve to point out this fact. The conclusions were reached only after twenty years of investigation on the part of the Survey, covering deposits in twenty-three states of the country. The great bulk of the caliche or natural material contained less than two percent of nitrate of soda; much of it contained less than one percent. It was stated that one aim of the reports was to warn the public against certain stock-promotion schemes based upon supposed deposits of nitrates. (5)

The mining and treatment of natural sodium nitrate is described as follows:

"The fact that the nitrate is found in thin, irregular patches at or near the surface leads naturally and properly to open-cut mining.

Where the area of any patch is sufficiently extensive and the grade of caliche is consistently high enough to permit regular working, the ground is opened by trenches. These are carried forward laterally across the ground to be mined, the caliche and overburden being drilled and blasted ahead of the trench, broken, and hand sorted in it, the waste rock piled back of the trench with the caliche on top, and finally the caliche hauled from there to the crushers along temporary narrow-gage railway lines connecting with main field lines ramifying over the property. When the patches are too small or the grade too irregular

(4) Oil, Paint and Drug Reporter---Feb. 11, 1929; p 48---Aug. 19, 1929; p 51.

(5) Ibid. Apr. 27, 1931---p 50; June 6, 1932---p 51.

the material is won by the older style of mining, which involves working small pits from which the nitrate is collected by carts.

Formerly all the drilling and blasting was done entirely by hand, and carts were used to bring all the nitrate to the main field lines. Now, at many of the properties, air drills have been introduced for breaking up the big blocks, and efforts are being made to use them in the first breaking up of the ground as well. At present the latter work is still accomplished at most oficinas by putting down with hand jump drills and small "pop" shots a hole 6 to 8 inches in diameter, chambering it below the nitrate bed, and blasting with some 300 or more pounds of a cheap slow-burning black powder made locally. Since the effect of such a shot is to heave the ground up in blocks of as much as 12 feet in diameter, the necessity of secondary blasting is evident. It is not the purpose of the mining to break the rock fine, as this increases the loss. The large blocks are broken with 25-pound sledges and the caliche separated from the barren rock by hand sorting in the pit.

In special cases drag-line scrapers and steam shovels have been introduced.

Transportation of the caliche to the treatment plant is by field railway lines of various gages. In part carts are still used, but now rarely except to gather caliche mined in small patches or from outlying parts of the property. There is a distinct trend away from carts and toward direct loading. There is a further tendency toward larger central treatment plants drawing caliche from greater distances and the use of heavier locomotives and rolling stock. Formerly haulage of one-half mile and a mile and a half was the usual limit. Now caliche is hauled as much as 25 miles in heavy trains of 15-ton cars running on well-built main lines. When necessary, caliche is brought to the main lines over temporary 60-centimeter tracks in 7-ton side-dump horse-drawn cars.

With the exception of one plant, all those in the nitrate region that are in regular operation are built for the Shanks process. At the Delaware oficina of the Du Pont Nitrate Co., a modification of this, designed by Mr. A. W. Allen and known as the Allen process, has now been in successful use for more than a year.

Essentially the Shanks process is one of treatment of coarse crushed rock by countercurrent leaching, the aqueous solution being brought up in strength and temperature to boiling point, decanted, cooled, and returned for reuse. The caliche contains a number of water-soluble salts, of which sodium nitrate and sodium chloride are most important. It happens that the solubility of sodium nitrate increases with rise in temperature at a much higher rate than does that of sodium chloride. Indeed, at the higher temperatures involved, the solution in the presence of

caliche will precipitate sodium chloride and take up additional nitrate. The nitrate rich solution is then drawn off, clarified, and allowed to cool. As the temperature falls nitrate crystallizes out, the other salts being retained in solution. The excess solution is drawn off, the nitrate drained or put through centrifugals, and the liquor sent back for reuse. These are the essentials of the process; but there are many minor complications and side processes such as those involved in precipitating "high potassium" nitrate, "96 percent nitrate", "98 percent" nitrate, recovery of iodine as a by-product, hastening precipitation, recovery of heat, and other similar matters. In general, however, the plants are operated to produce the standard "95 percent" nitrate with the minimum of loss in the refuse *** and the highest speed of treatment (to secure plant capacity) consistent with making acceptable recoveries."(6)

The Shanks process of refining, referred to above, has been employed since 1878. It is now being superceded in many oficinas by the Guggenheim process, which has been developed within the last few years. In this latter process the caliche is treated with cool or warm water and later precipitated by refrigeration. Heat for the process is derived from water from the Diesel engines that are used for power in the plants. A granulation plant was installed in 1928.

With the Guggenheim method the entire process is mechanized; even hand-sorting at the field is eliminated. A much lower grade of caliche can be used than would be possible under the Shanks system. The Guggenheim process results in a free-flowing 98.5 percent pure nitrate, which is very easy to apply to the soil. It is also claimed that this process reduces the cost of production one-third, making it more economical to use in the long run. (7)

(6) Bain and Mulliken, "THE COST OF CHILEAN NITRATE", pt. I

(7) Bulletin of Pan American Union; 65:513-14, May, 1931.

An enormous drawback to the use of the Guggenheim process to any great extent is the great cost of the required installation. The patent rights are all closely held by a small group---another barrier to extension of use.

"FIXED NITROGEN":

The element nitrogen makes up about four-fifths of all the air which surrounds us. The manner by which it could be taken from the air and placed into a commercially useful form had long baffled scientists. The Germans were the first people to successfully solve the problem. They used this form of nitrogen with great success during the War when they were cut off from the Chilean fields. Nitrogen itself could easily be extracted from the air, but in its natural state it was of little commercial use. The remedy to the situation lay in combining the nitrogen with other elements which acted in the role of "carriers". This process of combining the nitrogen with other elements is known technically as fixation, and the product is "fixed nitrogen". There are three main methods of fixation: the arc process, the cyanamide process, and the direct synthetic ammonia process.

ARC PROCESS: "In the arc process the basis of the chemical change is the partial conversion at high temperatures of nitrogen and oxygen to form nitric oxide. Air is passed rapidly through a zone of exceedingly high temperature produced in an electric arc furnace. Nitric oxide, NO , is produced, which on cooling in the presence of the accompanying oxygen forms nitrogen dioxide, NO_2 . The nitrogen dioxide produced is absorbed in water, giving dilute nitric acid. This is the only one of the three

processes which produces nitric acid directly.....In the arc process the existing air mixture is used, the only pretreatment of the air consisting of the removal of the carbon dioxide and water vapor ingredients." (8)

The arc process has been carried out for the most part in the Scandinavian countries, where there is enormous waterpower sufficient to cheaply generate the great wattage of electricity required for the arcs.

CYANAMIDE PROCESS: "In the cyanamide process nitrogen is fixed by bringing it in contact with finely powdered calcium carbide heated to $1,000^{\circ}$ C. Calcium cyanamide, CaCN_2 , is formed....It is first necessary to effect the isolation of the nitrogen component from the other ingredients, in other words, to remove the oxygen as well as the water vapor and carbon dioxide." (9)

Cyanamide has about a 16% nitrogen content. It is slower acting than some other fertilizers, as it must decompose in the soil before becoming available to the plants. It is not well suited to either saturated or sandy soils. (10)

DIRECT SYNTHETIC AMMONIA PROCESS: "...accomplishes the direct synthesis of ammonia, NH_3 , from nitrogen and hydrogen by passing a compressed mixture of these two gasses over a catalyst at high temperature. Iron oxide is said to be the best catalyst base known at present. The gas coming off is a mixture of nitrogen, hydrogen, and ammonia, from which the ammonia is removed by absorption or refrigeration, and the other gasses are returned to the catalyst for further ammonia formation. There are a number of methods of operation of the direct synthetic ammonia process, which have come to be called processes. These include the Haber-Bosch, Claude, Casale, Fauser, and other processes. In all of these processes, however, nitrogen is fixed with hydrogen in the presence of a catalyst. In this method also it is first necessary to effect the isolation of the nitrogen component from the rest of the atmosphere before fixation." (11)

(8) Reprinted from U.S. Bureau of Mines Information Circular 6385---p.10.

(9) Ibid.

(10) Encyclopaedia Americana---Vol. 11, p. 146.

(11) Same as (8), (9).

In the direct synthetic ammonia process, the largest single item of cost is that of hydrogen; some cheaper source of hydrogen must be found before the cost of production can be materially reduced. (12)

One of the chief difficulties in the way of using synthetic ammonia fertilizers is the problem of finding a suitable carrier. Phosphoric acid has been used to some extent, but little progress has been made in this country in this line of research. (13)

BY-PRODUCT NITROGEN:

"In the coking of coal the nitrogen contained in the original coal becomes distributed between the coke, the tar, and the gas. The only portion valuable for its nitrogen content is the gas, in which the nitrogen occurs chiefly as ammonia. This ammonia is recovered by washing with water or with sulphuric acid and forms either ammonia liquor or the compound ammonia sulphate, according to which of the two liquids is used as the washing agent."(14)

AMMONIA-COMPOUND FERTILIZERS:

"Sulphate of ammonia, $(\text{NH}_4)_2\text{SO}_4$, when pure is an odorless white salt, soluble in water, which contains a little over 21 per cent of nitrogen. The commercial grade varies in color from white to gray and brown and contains 20 to 21 per cent of nitrogen. The average analysis of commercial by-product sulphate of ammonia produced in the United States is said to show...20.56 to 20.80 per cent of nitrogen.... " (15)

"Ammonium sulphate-nitrate is a double salt of ammonium sulphate and ammonium nitrate manufactured in Germany and Italy for fertilizer purposes and sold under the trade name of "Leunasalpeter". It contains about 26 per cent of nitrogen, about one-fourth of which is in the nitrate form and the remainder of which is ammonia nitrogen."(16)

"Potassium ammonium nitrate...contains about 16 per cent of nitrogen... Prepared in Germany and marketed... for fertilizer use." (17)

(12) American Yearbook, 1928 (13) Ibid, 1926.

(14) Bureau of Mines Information Circular 6385 p.10.

(15) Ibid. p. 25. (16) Ibid. p. 24. (17) Ibid. p. 25.

OTHER NITROGENOUS FERTILIZERS:

Calcium nitrate, or nitrate of lime, contains about 17 per cent of nitrogen, although the commercial form usually contains merely about 15 percent. This substance absorbs and holds water very easily; because of this hygroscopic nature, it must be shipped in drums of water-proof bags. (18)

There is also a synthetic nitrate of soda, containing practically sixteen and one-half per cent of nitrogen. This synthetic product is manufactured for the most part in Germany and the United States. (19)

Germany has within the last few years put on world markets a series of highly concentrated complete fertilizers. They contain various amounts of nitrogen, potash, and phosphorus---all necessary for good plant growth. (20)

Urea is the most concentrated of all the nitrogen-containing compounds used as fertilizers. The commercial grade contains about 46 per cent of nitrogen. One of the great American companies manufacturing synthetic urea sells almost its entire output to other makers of compound fertilizers.

The trend in nitrogenous fertilizers seems to be toward substances which either contain other necessary substances besides nitrogen, or else present the nitrogen in more than one way in the same mixture.

(18) Bureau of Mines Information Circular 6385, p. 24.

(19) Ibid.

(20) Ibid. p. 25.

SECTION B---EXPLOSIVES

Perhaps the first thing that comes into our minds when we think of explosives is a thought of war. That is where explosives have been employed in their most spectacular uses. However that may be, modern peace-time uses are doing much to rival in grandeur and magnitude the most impressive war-time displays. Modern engineers have so controlled explosives that they can make the substances do their bidding explicitly, from the felling of a giant brick chimney to the preparing of sites for huge dams or tunnels. The nature and strength of the charges are figured out in advance with mathematical precision, and the results are calculated with perfect exactness. Man has thus made explosives his servants in constructive as well as in destructive enterprises.

The evolution of explosives through the ages presents an interesting story:

"Black powder was gradually developed from "Greek fire", and was known before anyone thought of using it in firearms. It was originally composed of more or less intimate mixtures of potassium nitrate, with charcoal, resin, native paraffin, petroleum containing earth and other combustible substances, and was used partly for fireworks and partly for the production of fire and smoke for military purposes. The first employment of such mixtures as propellants was probably in the latter half of the thirteenth century. For six hundred years black powder remained the sole chemical propellant, until finally in the last ten years of the nineteenth century it was replaced by the

gelatinized smokeless powders. At present black powder is used to a very limited extent for ballistic purposes, mostly in the form of sporting powders.

The oldest composition of black powder from potassium nitrate, charcoal and sulphur has undergone very few changes in the course of time..... Various attempts have been made to substitute the various components of black powder by other substances having similar properties. Thus, potassium nitrate has been replaced by sodium nitrate, barium nitrate, and even ammonium nitrate, in spite of its deliquescence in moist air."(21)

"Almost all smokeless powders consist mainly of nitrocellulose in a more or less completely gelatinized condition..... Nitroglycerine-containing powders have nitroglycerine and nitrocellulose as the principal ingredients. Both explosive substances are most intimately combined in the gelatinized condition." (22)

"In the course of experiments to find a more suitable absorbent for nitroglycerine...., A. Nobel (Engl. Patent No. 41, 791) discovered, in 1875, that a certain kind of collodion cotton even in small quantities can transform liquid nitroglycerine to a gelatinized mass which is a much more powerful explosive than guhr dynamite, leaves no solid residue on explosion and yields no nitroglycerin in the presence of moisture. This preparation was called

(21) "EXPLOSIVES"---Dr. H. Brunswig---Ch. IX, Sect. 182, p. 237.

(22) Ibid. Sect. 183, p. 242.

"Explosive gelatin".

Explosive gelatin consists of from 90 to 93 per cent nitroglycerine and from 7 to 10 per cent of a special kind of collodion cotton. These are united by warming and stirring into a homogeneous, transparent and elastic gum.....

Explosive gelatin is one of the most powerful of explosives and is, therefore, suited for shattering very solid and tenacious material. It is much less sensitive to shock and friction than guhr dynamite." (23)

SECTION C---OTHER USES OF NITRATES

Nitrate of soda is used in the production of dyes, sulphuric and nitric acids, as material for the manufacture of potassium nitrate, as a chemical reagent and as a flux in industry.

Nitric acid is used in refining metals, in brass and other metal finishing, in dyeing, etching copper plates and printers' rolls, manufacture of jewelry, electroplating, photoengraving, manufacture of explosives, manufacture of dyestuffs and intermediates, cotton printing, manufacture of foodstuffs, and for nitrating cotton.

Potassium nitrate is used in the manufacture of glass and ceramics, matches, pyrotechnics, fertilizers, candles, for pickling candle wicks, pickling meats, processing tobacco, and also in medicine.

Man is constantly making advances in the field of chemistry, and it is probable that many new and enlarged uses will be found for nitrates in the future. Chemists have recently discovered that Nitrate of soda has great potential use as an industrial sanitary agent:

"Cheap and effective means of chemically treating industrial waste with nitrate of soda previous to its discharge into streams, preventing pollution, has been practically applied by a Boston engineering concern, which specializes in sanitary work. Tests with the new American synthetic nitrate of soda, recently put on the market, are under way in various parts of the United States.

Until recently, lime and chlorine were the two most-used chemicals in canneries, paper mills, and wood-scouring plants, where the waste makes an objectionable odor when it decomposes.

The new use of nitrate of soda was discussed recently at a meeting of the American Chemical Society at Columbus, Ohio.

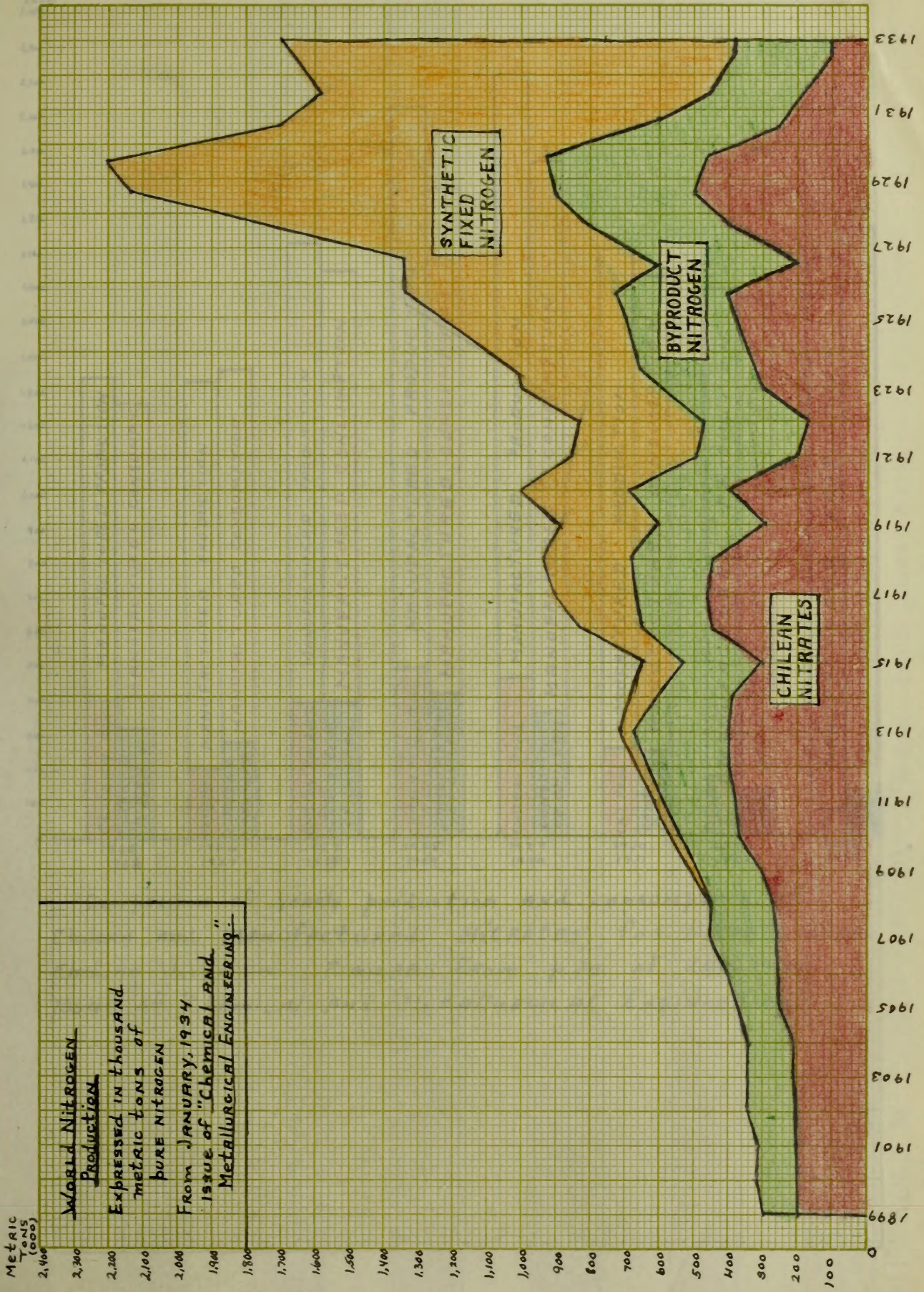
The nitrate of soda acts as an oxydizing agent. It furnishes active atoms of oxygen, which do the oxydizing. Then it takes up the inactive atoms of oxygen in the waste solution, making them active. These atoms are given up to do oxydizing work, and the process continues. The amount of nitrate depends upon the kind of waste. Generally there is needed one pound of nitrate for each thousand gallons of waste water." (24)

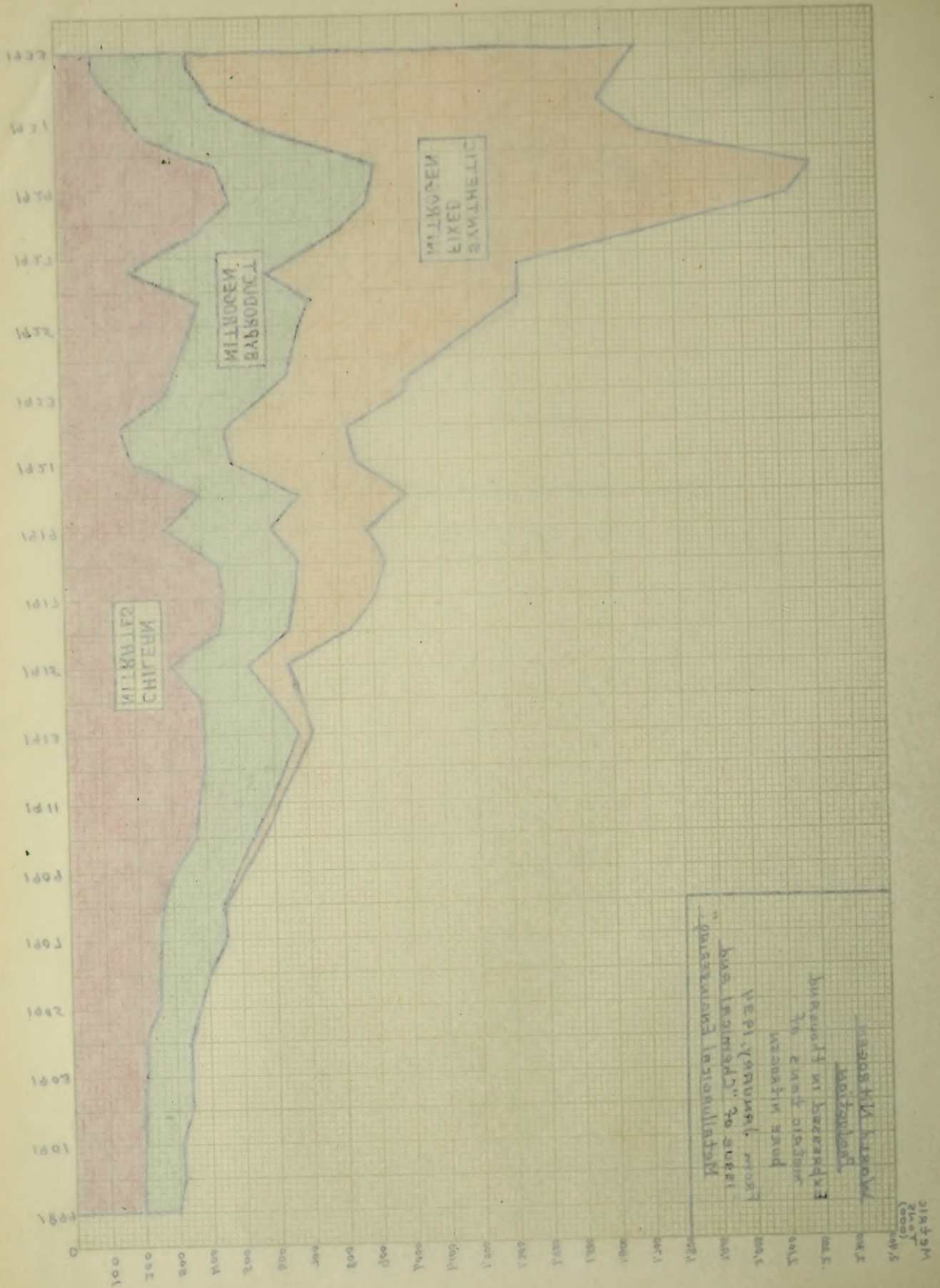
It will thus be seen that there is hardly any major industry which cannot profitably use nitrates in some form or another; they form one of the bases of our modern industrial civilization.

(24) Oil, Paint and Drug Reporter; May 26, 1930; p. 78.

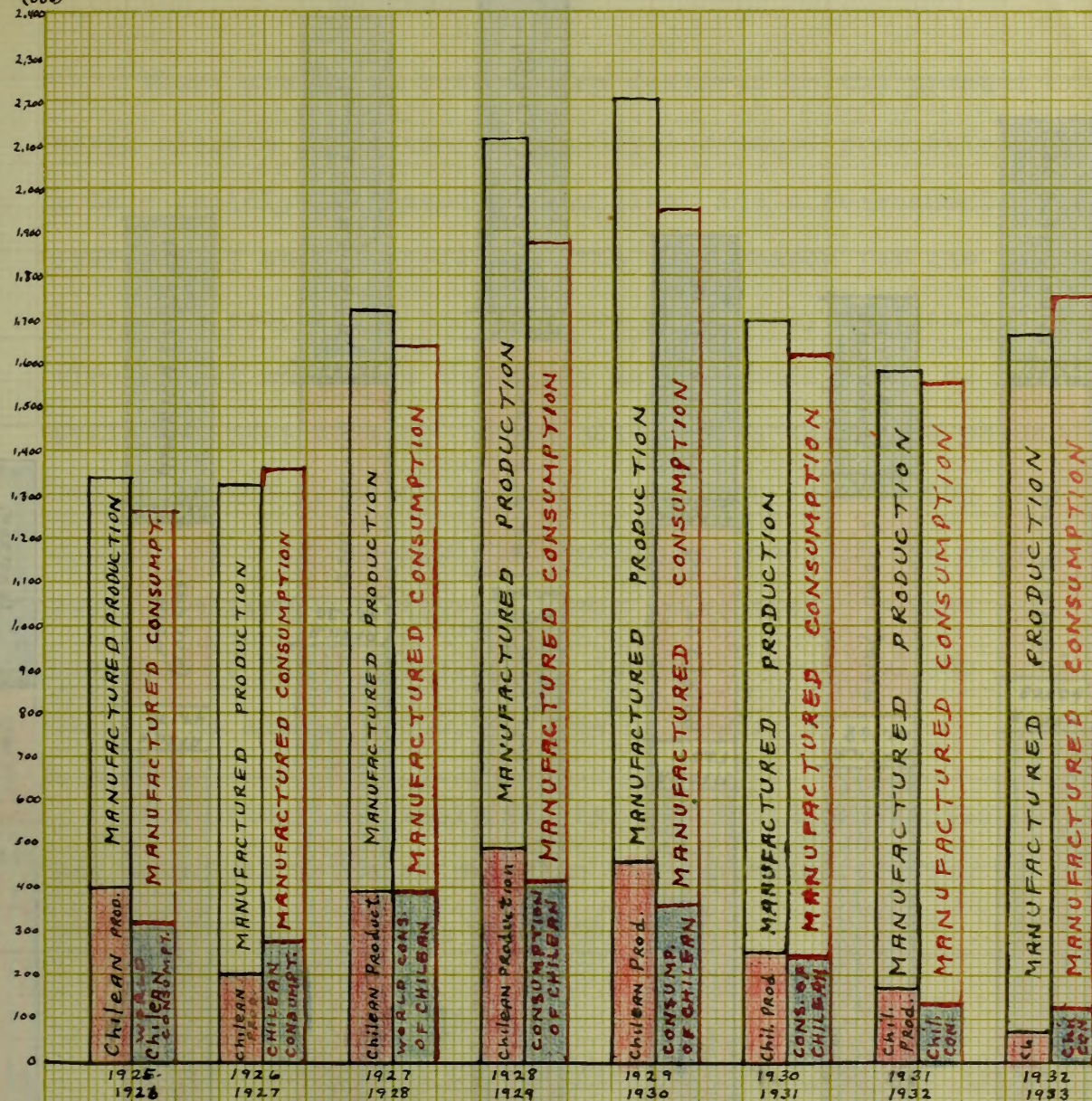
PART II

INTERNATIONAL SITUATION
OF SUPPLY AND DEMAND



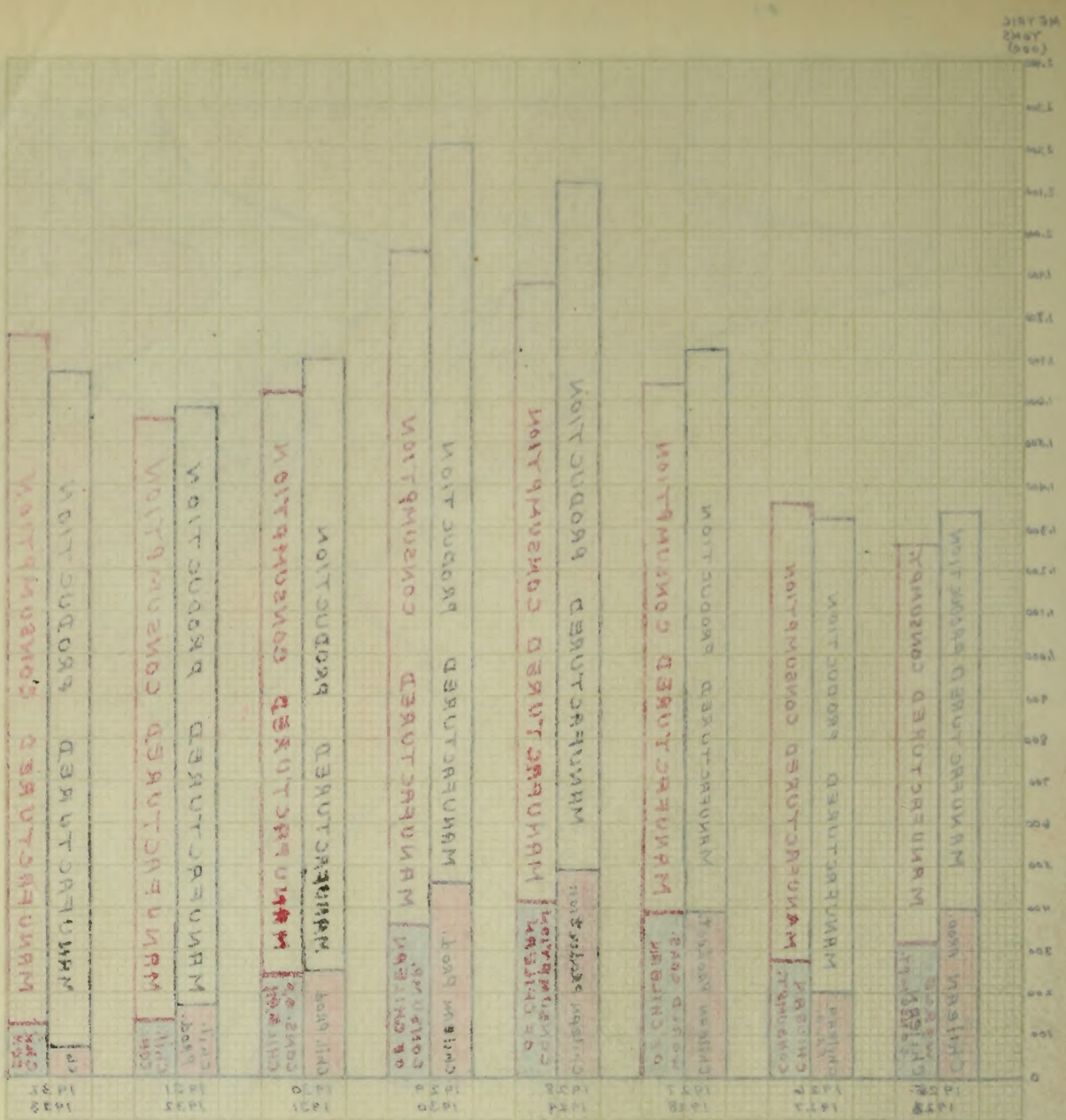


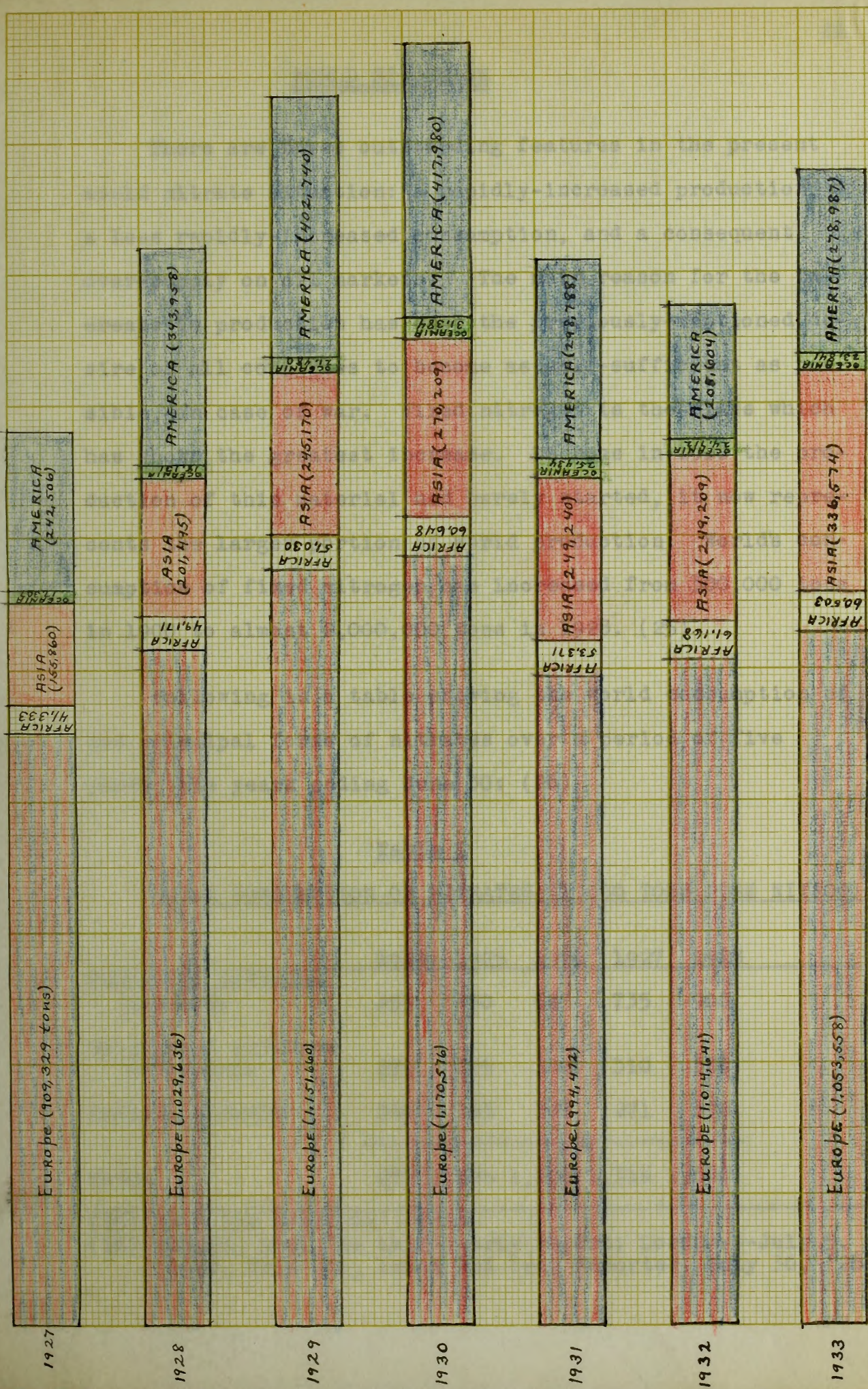
METRIC
TONS
(000)



Comparison of yearly production and consumption of Chilean and manufactured nitrates, for nitrate years ending June 30. Figures from p.30 of JAN. 1934 issue of 'Chemical and Metallurgical Engineering'.

Comparison of yearly production and consumption of
 Chlorine and Manufactured Nitrates, for Nitrate years
 ending June 30. Entered from p. 30 of JAN. 1934
 Issue of Chemical and Metallurgical Engineering.





NITROGEN CONSUMPTION - Metric tons pure Nitrogen Consumed.
 p. 32 of JAN, 1934 Issue of "Chem. and Met. Engin."

WORLD SITUATION

There are three outstanding features in the present world nitrate situation: a rapidly-increased production, a less rapidly-increased consumption, and a consequent over-supply on all markets. The main reason for the increase in production has been the previously-mentioned desire of all countries to become as self-sufficient as possible, in case of war. Fixed nitrogen is the class which has shown the greatest increase. Whereas in 1900 the production of this material had barely started, it now represents the larger portion of world production. World's consumption of fixed nitrogen has increased from 300,000 tons in 1900 to almost 2,000,000 tons in 1928. (25)

Following is a table showing the world consumption of the principal forms of nitrates over a period of five years, the years ending June 30: (26)

Table I

WORLD CONSUMPTION OF NITRATES, (1,000 TONS PURE NITROG)

	1924	1925	1926	1927	1928
Synthetic nitrogen products	355	450	585	735	900
By-product sulphate of ammonia	275	275	300	310	350
Chilean nitrates	340	363	323	271	390
Total	970	1,088	1,208	1,316	1,640

(25) American Yearbook---1928

(26) Ackman, Ltd., in half-yearly report; London---July 5, 1928. From Oil, Paint and Drug Reporter; July 30, '28.

The year 1928 was a banner one as far as nitrates were concerned. For the nitrate year ended June 30, 1928, production of all forms of nitrates, expressed in terms of pure nitrogen, increased 420,000 tons, or about 34%. According to a report of the British Sulphate of Ammonia Federation, Chilean nitrate of soda contributed 190,700 tons to this increase, the other sources contributing 229,000 tons. Total world consumption of nitrates increased 289,300 tons, amounting to about 22%, following an increase of 54,000 tons, or 4.2%, in the previous year. The increase in both production and consumption in 1928 was the largest which ever occurred in a single year, the increase alone being equal to the annual world output of twenty-five years previously. (27)

Table II shows both production and consumption of nitrates for both 1927 and the banner year of 1928, the amounts being expressed in metric tons of pure nitrogen, for the years ending June 30: (27)

Table II

<u>WORLD PRODUCTION AND CONSUMPTION OF NITRATES</u>		
	<u>1927</u>	<u>1928</u>
Total production	1,237,500	1,657,300
Total consumption	1,312,700	1,602,000
Approximate agricultural consumption.	1,200,000	1,450,000

The table shows that even in the banner year consumption increased at a slower rate than did production,

doing nothing to relieve the condition of over-supply that so characterizes the industry.

How was the production of the banner year of 1928 attained? Table III shows the percentages of the total production that was contributed by each of the principal sources of supply: (28)

<u>Table III</u> <u>WORLD PRODUCTION OF INORGANIC NITROGEN IN 1928</u>	
Chile nitrate	23%
Coke oven nitrogen	22%
Cyanamide nitrogen	14%
Synthetic ammonia and arc process nitrogen	41%
<u>Total world production</u>	<u>100%</u>

The above table shows that Chile, which was formerly practically the sole source of world nitrates, produced in 1928 only about one-fourth of the entire world supply. The manufactured product has placed Chile in dire straits.

Chilean producers did much to bring on the drastically low prices that prevailed for nitrates in Europe and Egypt during the first half of the year 1928. The reduced prices were by no means the result of a decrease in demand; rather, they came about because of the virtual dumping of Chilean nitrates upon the markets. Feeling the effect of the synthetic products upon their business, the producers of Chile began a fight to regain some of their lost markets---a fight that took the proportions of a

price war. In their rush to open new markets, the Chilean producers consigned their nitrates to new organizations, who were not able to handle the huge amounts coming in except by cutting prices. If that were not bad enough, the amounts consigned were out of all proportion to the amount of business which might reasonably have been expected. In spite of the resulting low prices, consumption was not speeded up---people kept waiting for still lower prices which they thought would be the result of the war. (29)

Production and consumption of nitrates for the year 1929 were more nearly balanced. In that year the total world production, both of natural and synthetic materials, amounted to 2,365,000 metric tons; while the consumption was 2,265,000 metric tons. It is true that supply still kept well ahead of demand; yet the discrepancy was not as great as it had been in other years. (30)

For the year 1929 we also have specific figures relative to the world use of the Casale process for the making of synthetic ammonia. (31) In December of 1929 there were 22 plants with an aggregate daily capacity of 901 metric tons of anhydrous ammonia operating in the world. That compared with 18 plants of 655 tons of daily capacity in December of 1927. The increases per country in metric tons of capacity per day since 1927 were: Belgium, 56; France, 49; Germany, 60; Canada, 8; and Japan, 100 tons.

(29) Oil, Paint and Drug Reporter; J1 30, 1928; p. 37

(30) American Year Book, 1929; p. 315

(31) Oil, Paint and Drug Reporter; Jan 20, 1930; p. 44

Table IV shows the number of tons of daily capacity of Casale plants in various countries in December of 1929, as well as proposed increases in production in each one.

Table IV

ACTUAL AND PROPOSED CASALE AMMONIA CAPACITY OF WORLD IN
DECEMBER OF 1929

Country	Daily capacity (metric tons)	Proposed increase in capacity (M.T)
Italy	41	16
Belgium	80	180
Canada	8	---
Dalmatia	---	48
France	388	8
Germany	60	90
Japan	262	200
Russia	24	24
Switzerland	23	---
United States	<u>15</u>	<u>---</u>
World Total	901	566

Speaking of the year 1929 in particular, the American Casale Company stated that it had been proven that the process operated with hydrogen from coke-oven gas or from water gas, as successfully as with that derived from the electrolysis of water, for which the process was originally intended. Of the plants using the process, 14 used coke-oven gas hydrogen, 3 used water gas hydrogen, and 1 used by-product hydrogen. In plants using coke-oven gas hydrogen, the rated production capacity of casale units had actually been exceeded by quantities ranging from 25

to 50 per cent in continuous operation. These experiments in using different kinds of hydrogen in the process are in line with previously-mentioned endeavors to find a cheaper source of hydrogen---that being the only way by which the cost of the synthetic ammonia process may be decreased.

Table V, giving statistics for the world's Fauser process ammonia plants in December of 1931, may be compared with the Casale table (IV) on page 26. Information for Table V was sent to the Department of Commerce by the Trade Commissioner at Rome. (32) Daily capacities are given for each country in metric tons:

Table V

<u>WORLD FAUSER AMMONIA CAPACITY---DECEMBER, 1931</u>		
<u>Country</u>	<u>Number of plants</u>	<u>Daily capacity (metric tons)</u>
Italy	5	180
Holland	2	270
Poland	2	125
Belgium	2	180
Germany	1	15
Sweden	1	15
Japan	1	70
Russia	1	100
Canada	<u>1</u>	<u>50</u>
World Total	16	1,005

The general world situation in the field of nitrates

for 1931 was not very encouraging. In that year, the total sales corresponded to only 35% of total productive capacity (against 76% in 1929), and to only 58% of production (against 80% in 1929). The following tables will show at a glance the comparative figures for the years 1929, 1930 and 1931: (33)

Table VI

CAPACITY, PRODUCTION AND SALES OF NITRATES IN WORLD
(in millions of tons of nitrogen)

	1929	1930	1931
Capacity	2.5	2.8	3.2
Production	2.4	2.	1.9
Sales	1.9	1.6	1.1

Table VII

RELATIVITY OF PRODUCTION, CAPACITY AND SALES OF
NITRATES

	1929	1930	1931
Production : Capacity	96%	75%	60%
Sales : Capacity	76%	57%	35%
Sales : Production	80%	76%	58%

The first table (VI) shows that capacity alone showed an increase in the three years; both production and sales taking sharp drops, the latter falling off almost one-half. Likewise it will be seen that each one of the ratios in Table VII has decreased sharply. No explanation is needed, as the tables tell their own story

For the year ended June 30, 1932 the British Sulphate of Ammonia Federation (34) stated that the total nitrogen productive capacity of the world was estimated at about 3,400,000 metric tons exclusive of Chile. It was indicated in the report that the manufactured nitrogen industry of the world operated during the fiscal year 1932 at approximately 42% of capacity. World production of fixed nitrogen during the year decreased 140,584 metric tons, or about 8.3% in actual output. Chilean production decreased about 80,000 tons, or 32%; while the rest of the world's production fell off 60,584 tons, a drop of 4%. The total production of pure nitrogen for the year was announced as 1,553,704 metric tons, which compared with 1,694,288 for the previous twelve months, and with 2,203,540 for the fiscal year ending June 30, 1930.

World consumption of pure nitrogen was announced by the Federation as 1,559,788 metric tons, which, for the first time in many years, was greater than the production for that year. Of this total, 138,208 tons was Chilean nitrate, while 1421,580 tons were of manufactured nitrogen. These consumption figures compare with figures for the 1931 fiscal year, when the total consumption was 1,621,305 metric tons, of which 244,300 tons were from Chile and 1,377,005 tons were of manufactured origin. Total world consumption of nitrates during the fiscal year decreased 61,517 metric tons, or 3.75%, following a decrease of 17% in the preceding year, and increases of 4% in 1930, 14% in 1929, and 20% in 1928.

(34) Oil, Paint and Drug Reporter; D 26, '32; p. 15.

Also from the report of the British Sulphate of Ammonia Federation come figures for the agricultural consumption of nitrates for the nitrate year ended June 30. This consumption for the year ended in 1932 was about 1,409,000 metric tons, compared with a consumption for the same purpose of about 1,455,000 metric tons in the preceding year.

The year 1932 also saw the beginning of proceedings for fraudulent bankruptcy against the directors of the board of the great European Chemical Holding Company Ammonium A. G. This concern, with headquarters in Switzerland, was created in 1928 through the influence of the Prince of Pless for the purpose of operating various chemical works. It was capitalized at 2,500,000 Swiss francs.

The company, which planned to build nitrogen plants in Upper Silesia and Poland, found itself in financial difficulties in 1931. Relief was first sought through a creditors' agreement, but later a committee had to be appointed to take charge. In September of 1931, bankruptcy proceedings were started against the company, and it was found that liabilities exceeded 40,000,000 francs, Swiss money. (35)

INTERNATIONAL CARTELS:

Because of the world over-production which was so prevalent, nitrates producers realized that for their own salvation they must come together in some sort of international agreement. That was easier said than done, how-

(35) Oil, Paint and Drug Reporter; A 1, '32; p. 14.

ever; it proved a difficult task to hold together in common bonds the diverse interests of producers in various parts of the world, each with the desire to get the best possible advantage.

Germany, the world center of the synthetic nitrogen industry, was the first country to realize the importance of imposing some kind of regulation upon the plants. The result of negotiations was an agreement between certain of the larger producers as to prices and market quotas. The members of the German syndicate later made agreements with manufacturers in Norway, Britain and Italy. (36)

The first great international cartel in the nitrate industry was formed in 1929. (37) The members were the I. G. Farbenindustrie A. G.; the British Imperial Chemical Industries, Ltd.; and the Chilean producers, represented by the Minister of Finance of Chile. The object of the cartel was to promote the use of nitrates in agriculture throughout the world except in the United States, and to engage in joint advertising. A stabilization program for prices was also part of the plan.

Such an agreement had long been planned by the Central Chamber of Commerce of Chile, which had carried on extensive relations with similar bodies in many countries of the world. The Chamber had long urged the Nitrates Producers' Association to send samples and descriptive literature to chambers of commerce in world centers of fert-

(36) Bureau of Mines Information Circular 6385; p. 11.

(37) Oil, Paint and Drug Reporter; Jl 1, '29; p. 21.

ilizer consumption.

In August of 1930, another synthetic nitrogen cartel was formed among the European producers. The principal member countries were Great Britain, France, Germany, Belgium, Italy, Sweden, Poland and Czechoslovakia. (38) A few days later the German Nitrogen Syndicate, a member of the cartel, and acting on behalf of the other members, signed an agreement with the Chilean natural nitrate interests.

The cartel of 1930 embraced 98% of all European synthetic production, and 80% of the world output of natural and synthetic nitrogen. Like the previous cartel, the one of 1930 did not include the United States in its plans.

This cartel aimed to reduce all production to 70% of capacity. Countries such as France, which were not producing enough for domestic requirements, might increase their production; but all European manufacturers were assured of being able to produce up to 70% of capacity without a loss. (39)

The Farbenindustrie, the Imperial Chemical, and the natural producers all agreed to cut down production. All exporting was to be in the hands of a central body. Those countries which were producing at greater than 70% of capacity were to receive no exporting facilities until other

(38) Bureau of Mines Information Circular 6385; p. 11.

(39) Oil, Paint and Drug Reporter; S 22, '30; p. 48.

countries which had observed the 70% limit had disposed of their excess production. A common pool to which all producers subscribed amounted to about \$10,000,000. The pool was operated from Basle, Switzerland, where the operating company was established. Synthetic nitrogen producers of Europe were to pay to the pool 35 marks for each ton of nitrogen in respect to 70% of their capacities for the year 1931-32; by-product makers and mines were to pay 25 marks for each ton of actual output; and Chilean producers were to pay one-third of the sum of the payments of the above-mentioned producers.

The agreement was made retroactive to August 1, 1930. Besides regulating prices, it aimed to foster trade promotion for nitrates in general. Exports to non-producing countries were regulated, and a fixed differential was established between Chilean and synthetic nitrates. (40)

In May of 1930, a European cyanamide cartel was formed. The U. S. Trade Commissioner at Berlin reported that all export sales of the cartel were to be handled by the European Cyanamide Export Co., Ltd. of London. The cartel embraced producers in Germany, France, Italy, Belgium, Yugoslavia, Scandinavia, Switzerland and Poland. The agreement provided that producers in each of the member countries should try to control their own home markets, and that all exports should be through the common sales agency. (41)

(40) Oil, Paint and Drug Reporter; A 18, '30; p. 21.

(41) Ibid. p. 48.

The general nitrogen cartel of 1930 had been for a period of one year only. Before that year was over, the members met in conference to see whether or not they could agree on a basis by which the cartel could be extended for another year or longer. Such an agreement proved to be impossible. In the first place, Norway demanded that France licence imports from Norway of 35,000 tons of calcium nitrate; when France refused, Norway threatened to dump 12,000 tons of the material on the French market. Germany requested France, Belgium, the Netherlands and Denmark to restrict or prohibit the importation of nitrate of soda from Chile; but they refused to do so. France demanded a nitrate production quota based on theoretical military needs, and not upon commercial requirements; Germany would not even discuss the question. With such diversity of opinions among the members, it is no wonder that they failed to reëstablish the cartel. (42) This was merely another of the outward indications of the trend toward national self-protection in nitrates.

In spite of the failure of the great nitrogen cartel, the cyanamide syndicate continued to operate. The Trade Commissioner at Berlin sent word that notice was given to the effect that the syndicate might be terminated after June 15, 1931; but even in that event, the individual agreements between the countries involved would continue to be in force. (43) Production was to be cut by the members insofar as such cuts were not rendered undesirable by

(42) Oil, Paint and Drug Reporter; A 10, '31; p. 17.

(43) Ibid; S 28, '31; p. 40.

governmental protective measures, such as prohibitions of imports of cyanamide. If such prohibitions were made, the producers would have to maintain full production in order to satisfy home demands. Because of the nature of the syndicate, as explained previously, home markets were protected for all producers.

An ammonia sulphate price cartel was formed in Europe during April of 1932, in order to raise prices above the distress levels of the previous winter. Because the French market was well protected and regulated by law, the French producers did not enter into the cartel. (44)

Another international nitrogen cartel for the stabilization of prices and markets was formed in Europe in July of 1932. The members of the pact included producers from Chile, mostly American-controlled; Great Britain; Germany; Norway; the Netherlands; Belgium; Poland; Italy; France; Czechoslovakia; Switzerland and Denmark. (45)

In November, 1932, the International Conference on the Application of Fertilizers was held in Rome. There was proposed at the meeting the establishment of an international body to promote the use of chemical fertilizers. A committee of French, German and Italian delegates was formed to work out operating details of the proposed institute. Research was also to be carried out as to methods of application of fertilizers. (46)

(44) Oil, Paint and Drug Reporter; Ap 18, '32; p. 23.

(45) American Yearbook for 1932; p. 344.

(46) Oil, Paint and Drug Reporter; Ap 10, '33; p. 22.

CHILE

Although Chile is no longer the principal world source of nitrates, it deserves to be treated first among the producing countries of the world because of its colorful history and valient attempts to regain the world supremacy which it lost to the synthetic producers. As the various attempts were seemingly doomed to failure before they even began to operate, it is no wonder that they were uniformly unsuccessful.

We have seen how the World War gave the start to the synthetic industry; it also, for the time being, benefited the Chilean producers. The following quotations from an agreement between the Chilean government and the British Nitrate of Soda Executive in 1918 will serve to show the extent to which the Allies still relied upon the natural nitrate fields of Chile for their explosives: (47)

1. "The Nitrate of Soda Executive agrees to purchase, and the Chilean Government, on behalf of the companies producing nitrate of soda in Chile and whose names will be set out in a list to be furnished by the Chilean Government to the Nitrate of Soda Executive....agrees to sell 15,000,000 quintals (approximately 680,000 tons) of nitrate of soda at the price of 13 shillings 6 pence per quintal F. A. S. for refined, and 13 shillings F. A. S. for the ordinary."

2. "The Chilean Government agrees on behalf of said companies as follows:

- a. Vendors shall pay export duty on said 680,000 tons of nitrates.
- b. It shall be available for delivery on schedule from September to December, 1918.
- c. In event of failure of delivery....the Associated Governments shall be free to go upon the open market and purchase nitrate of soda from any or all of the companies producing nitrate of soda in

(47) Misc. No. 22 (1918) Memorandum of Agreement with Chilean Government; Cd.9149; London, H.M.Stationers.

Chile, enjoying in that event all necessary assistance from the Chilean Government."

3. "The Chilean Government agrees on its own behalf:

a. To furnish at once a list showing the oficinas from which they will obtain the said 680,000 tons of nitrate of soda, the quantity each will supply, the quantities already manufactured by the individual oficinas, and the quantities still to be manufactured by them. This list shall also show the quantities of oil, coal and bags at present in possession or under contract of said oficinas.

b. To furnish a list showing the exact dates on which quantities will be available for delivery at various ports.

d. That purchase and delivery of said 680,000 tons shall in no way interfere with or delay purchase and delivery of all or any other quantities purchased by the nitrate of soda Executive.

g. That the Nitrate of Soda Executive....shall on the 5th of September, 1918 invite offers for nitrate of soda on the open market at the unconditional rate of 13-6 and 13 shillings, which producers who do not intend to sell through the medium of the Chilean Government will be at liberty to accept."

4. "The Nitrate of Soda Executive on behalf of the Associated Governments agrees as follows:

a. To supply petroleum, coal and bags for the manufacture and export of said 680,000 tons of nitrate of soda....

g. That Associated Governments have the right to formulate at some future date, if they so desire, proposals for establishment of credits in all or any of the countries of the Associated Governments."

6. "The Nitrate of Soda Executive considers it most desirable that the Chilean government should undertake to place at the disposal of the Associated Governments the transports owned by the Chilean government for the carriage of nitrate of soda as soon as said transports become available."

"The Chilean government being desirous of complying with the desire of the Nitrate of Soda Executive...., will assign some of the transports owned by them for the purpose of the carriage of nitrate of soda to the United States of America as and when said transports become available."

7. "The Chilean Government are unable at the present time to give a definite reply to the request of the Associated Governments for an option on the total production of Chilean nitrate of soda for 1919."

The Associated Governments were later, without doubt, very glad that Chile had in the agreement refused to give them the option on her entire production for the next year. After the War there came hard times to Chilean nitrate producers, due both to the sudden decrease in demand and the fact that many synthetic plants had sprung up during the preceding few years in order to meet the abnormal demand. The supremacy of Chile as a producer of nitrates was practically over.

The events of the Chilean nitrate situation will be presented in chronological order year by year. In that way they will make a better picture than if they had been divided up into classifications, with a separate time order for each classification. The great Chilean government combination known as "Cosach" will not be discussed in the present train of events; space will be devoted to it in following pages. It has been such an important international organization that it deserves special mention.

Prices for Chilean nitrate of soda were very high in 1923; they were so high that the United States Department of Agriculture started an investigation into the methods of pricing the commodity. It found that all pricing rested with a London committee made up of British nitrate men. The Department claimed that such price-fixing caused inefficient production methods, resulting in still higher prices---prices which were prohibitive to many agricultural consumers, or potential consumers. (48)

The government of Chile placed an export tax upon all the nitrates sent out of the country. In 1926 the producers asked that the tax be reduced, as they claimed that it made it impossible for them to compete with the synthetic producers in world markets. To this request the government refused to agree; it claimed that methods and procedure used in the nitrate fields was inefficient, and that costs should be reduced through introduction of better technology. (49)

Although Chile, for the nitrate year ended June 30, 1928, contributed only 24% of the world's production for that period, there was an average increase of 42% in the world consumption of Chilean nitrates. This 42% resulted from averaging the following percentage increases: Egypt and Europe, 30%; United States, 48%; and other countries, 44%. The increase in the use of Chilean nitrate was due to a 17% drop in price which came about during the year. It will be remembered that the year 1928 was the banner year in Chilean production. (50)

The year 1928 was one of combination for Chile. That year saw the taking over of three English companies by one of the large Chilean producers, and also the absorption of a large German producer by an English company. Five groups of producers controlled about 58% of the total annual capacity of 6,000,000 tons. (51) In 1928 there was organized the Nitrate Distributors, Ltd., composed of four

(49) American Yearbook for 1926; p. 889.

(50) Oil, Paint and Drug Reporter; N 26, '28; p. 51.

(51) Ibid. J1 30, '28; p. 37

of the largest companies in the Chilean fields. The new company was organized to take care of over half of the Chilean production to be sold on the European and Egyptian markets. (52) By concentrating their European sales in this one large outlet company, the Chilean producers were able to present more of a united front to the synthetic manufacturers than each producer had been able to do by himself.

Table VIII shows the percentage of plants in Chile which were owned by men of various nationalities. (53)

Table VIII
PERCENTAGE OWNERSHIP OF CHILEAN NITRATE PLANTS

Yugoslavian	32.2%
British	18.4
British-Chilean	9.2
Chilean	8.5
Spanish	7.2
German	5.2
American	4.6
Spanish-Chilean	3.9
Chilean-Peruvian	2.6
American-Chilean-British	2.6
Peruvian	1.9
Yugoslavian-Chilean	1.3
French-Chilean	1.3
Bolivian	<u>.6</u>
Total plants in Chile	100.0%

(52) Oil, Paint and Drug Reporter; S 24, '28; p. 17.

(53) Ibid. A 6, '28; p. 73.

The Department of Commerce, in compiling this list, stressed the fact that the list was one of percentage of ownership of plants, and that it was in no way related to the volume of production. The greatest part of the production is in the hands of a few large British and American plants. The figures in the table are for the year 1928, although the various percentages probably remain much the same today.

On April 15, 1928, the Government, while announcing that there would be no reduction in the export tax for the coming nitrate year of 1928-29, said that it planned to co-operate with the home industry. On May 7 came the announcement that it would grant a subsidy of £ 250,000 for division among the various producers pro rata to their January to March, 1928 production. The Government moreover paid a bonus of 8 shillings per metric quintal of production, and established a fund of £ 1,500,000 to be used for the development of the industry. It was planned to renew the subsidy every three months, but that plan did not work out. In order to get a subsidy, producers could not sell below a price of 16 shillings, 4 pence per quintal. Later an announcement was made that the Government would grant producers an extra bonus equal to any reduction that might be made in price by the German synthetic producers when they announced their prices for the coming season. This bonus was to apply to all unsold nitrates in hands of producers or initial purchasers afloat or ashore in ports of destination as of June 30, 1928. It would

also apply to all nitrates shipped for consumption during the nitrate year 1928-29. On all contracts made before the new German price was fixed, the bonus had to be passed on to buyers; on all subsequent contracts it could be retained by the producers. The Government of Chile planned to readjust the bonus if there were later reductions in price by the German synthetic producers. (54)

The American Society of Agronomy is the sponsor of the Chile Nitrate of Soda Nitrogen Research Award, which amounts to \$5,000 as a yearly prize. It is annually awarded to those North American scientists who have made great achievements in studying the relation of nitrogen to soils and crops. The money came from a fund of the Chile Nitrate of Soda Education Bureau, and was made available for the first time in 1928. The first award, in December of that year, was divided among three Americans and one Canadian. (55)

In March of 1929, the Chilean Nitrate Producers' Association took steps to continue their organization until June 30, 1939. The selling corporation, which was organized in 1928, was made a part of the Association, which thereafter controlled both production and sales of producers. The nitrates of the Anglo-Chilean Company, which belonged to the Association but not to the selling organization, were to be sold by the Association, except in the United States. (56)

(54) Oil, Paint and Drug Reporter; J1 30, '28; p. 37.

(55) Ibid. D 10, '28; p. 47. Jan 13, '30; p. 50.

(56) Ibid. Ap 15, '29; p. 46.

In an effort to increase the demand for Chilean nitrate of soda, the Chilean Minister of Finance, the Budget Officer of the Finance Ministry, and the Chief of the Nitrate Division of the Department of Finance began in 1929 a world tour of the principal markets for nitrate of soda. They visited President Hoover in Washington to pay their respects on April 11, before going to call on importers. The trip was essentially a goodwill tour. (57)

Chile, in 1929, offered to accept bids for the operating rights to large nitrate beds in the Nebraska fields. The Anglo-Chilean Consolidated Nitrate Corporation put in the highest bid---for £ 2,500,000. Rival bidders were said not to be able to guarantee extraction of 80,000,000 quintals inside of 20 years, which was one of the requirements of the bid. The Anglo-Chilean Company, after a survey of the fields, thought that by means of their Guggenheim process they could extract from 100,000,000 to 120,000,000 quintals in that period; therefore, they were able to bid higher than their rivals. (58)

May 14, 1929 saw the consumation of an agreement whereby the Grace Nitrate Company transferred a large Chilean nitrate property to a British Company, the Tarapaca and Tocopilla Co. Both companies were thereafter operated by W. R. Grace and Co. Payment for the property was made by giving the Grace Co. 977,000 shares of 10 shillings each of the Tarapaca and Tocopilla Co. (59)

(57) Oil, Paint and Drug Reporter; Ap 15, '29; p. 46.

(58) Ibid. My 27, '29; p. 48.

(59) Ibid. Je 3, '29; p. 64.

The Lautaro Nitrate Corporation of Delaware was formed in 1929 by the Anglo-Chilean Consolidated Nitrate Company and the Lautaro Nitrate Company of London. The new company acquired plants and processes which enabled it to extract practically 100% of the nitrates from the ore, at a reduction in cost of about 40%. The processes were formerly owned by the Anglo-Chilean Company. The Lautaro stockholders obtained for their holdings the benefit of the Guggenheim Process. They traded their equity for fixed-dividend stock, and released to Guggenheim Brothers a part of that equity. The Guggenheims in turn agreed to turn their process over to the Anglo-Chilean Company, in which they owned the greater part of the stock; and the Anglo-Chilean Company licensed the Lautaro Company. To finance the transaction, there was a bond issue of \$32,000,000 floated on the New York Market by the National City Company---the largest bond issue of the year. It was oversubscribed as soon as it was offered. All of the 2,000,000 shares of common stock of the new company were owned by the Lautaro Nitrate Corporation. As the Anglo-Chilean Company owned more than 50% of the Lautaro Company, it will be seen that the Guggenheim brothers had a substantial grip upon the nitrate industry of Chile.(60)

Nitrates are being depended upon less and less as a source of revenue to Chile. As late as 1916, such taxes made up 60% of national revenue; in 1929 it was only 24%. This is in spite of the fact that the amount of nitrate taxes collected in the two years was about the same. (61)

(60) Oil, Paint and Drug Reporter; Je 24, '29; p. 49.
 (61) Bulletin of Pan American Union; May, 1931; p. 515.

This goes to show that Chile is finding other sources of revenue for the financing of her government. She is not yet independent of nitrates, however, as her fortunes go up or down with the prices of saltpeter.

Chilean production of nitrate of soda in 1929 was the highest in history. In that year the country produced 3,237, 594 metric tons, which was 62,770 tons more than the record year of 1928. Exports for 1929 were 2,841,900 tons, compared with 2,132,900 tons in 1928. World consumption of Chilean nitrate in 1929 was 2,677,200 metric tons, against 2,525,700 in 1928. However, in spite of the increased sales, stocks at the end of the year were higher than at the end of the previous year. (62)

In 1929 the Chilean Nitrate Producers' Association changed the entire plan of marketing of nitrates, except for the United States. Formerly the nitrate had been sold by brokers in Chile; under the new plan, there was direct distribution from producing companies to exporters, doing away with the added cost of brokerage. Distribution was governed by a sales commission in London, composed of two representatives of the Chilean government, and one delegate from each of the four leading producers of Chile. This was still another plan by which Chilean producers hoped to bring their prices down to where they could compete more favorably with the synthetic producers. (63)

The Chilean Nitrate Producers' Association was dis-

(62) Oil, Paint and Drug Reporter; Mr 10, '30; p. 60.

(63) Ibid. F 3, '30; p. 52.

solved on June 30, 1931 as part of a government scheme for the reorganization of the industry. With the dissolution of the Association, the Chile Nitrate of Soda Education Bureau automatically ceased to exist, as it was part of the Association. Its work was continued by the huge combine "Cosach", under the direction of a new corporation, the Chilean Nitrate Educational Bureau, Inc., with offices in New York City. (64)

During the first part of 1932, Chile was making negotiations with Russia whereby the former hoped to exchange from 50,000 to 100,000 tons of nitrates for Russian gasoline, lubricating oil and fuel oil of the same value. If the deal had gone through, it would have made business worth about \$1,250,000. The deal struck a snag, however, when it was found that Cosach, the nitrate combine, did not have it among its powers to act as a distributor for oils and gasoline. So the Russian products would have done it no good if it had taken them. Cosach made offers both to the West India Oil Company (Standard) and to Shell-Mexican Petroleum of Chile Ltd., to try to get them either to purchase the Russian products or to act as distributors for them; but both companies refused. Then there was a suggestion that the government of Chile accept the Russian petroleum products instead of the large periodic cash payments due it from Cosach. This proposal seemed to find more favor than the other, perhaps due to the fact that the government was thinking of establishing an oil monopoly in Chile, but up until June of 1933, there

had been nothing done on the Chilean-Russian exchange. (65)

The real slump of Chilean nitrates came in 1932. In that year sulphate of ammonia, the principal competitor of Chilean nitrates, was selling in the United States for just about one-half the price of nitrate of soda. Chile was relying for a long time on the hope that European producers would get together and really cut down production and raise prices; but the inability of European producers to stick together long enough to accomplish anything in the line of price stabilization finally resulted in leaving Chilean nitrates entirely shut out of all important world markets. (66) The international agreement of July, 1932 did much to save the Chilean industry from ruin, Chile in that agreement being awarded 30% of the world nitrate quota for one year. (67)

In order to get her industries through the hard times, Chile, in 1932, had to grant liberal credits to the nitrate companies. A governmental decree of July 4, 1932 established the Industrial Credit Institute, with a backing of 40,000,000 pesos. Of this amount, 10,000,000 pesos might be used to aid the nitrate industry in the form of loans. Another decree published in August of the same year increased the funds of the Institute to 55,000,000 pesos, of which 25,000,000 were to be available to the nitrate industry, for use in operations. (68)

(65) Oil, Paint and Drug Reporter; Ap 18, '32; p. 16.

(66) Ibid. Je 27, '32;

(67) Ibid. Ag 29, '32; p. 14

(68) Ibid. S 26, '32; p. 51.

In 1932, Chile experienced a short wheat crop. The country usually supplies all its own requirements in that regard, but the crop for 1932 was insufficient for domestic consumption. As the country had little money with which to purchase wheat from other parts of the world, it tried to negotiate an exchange with other countries, in which it hoped to swap some of its nitrates for wheat. It approached the Federal Farm Board in the United States, but the two groups were unable to come to any understanding. The trouble was that the Farm Board would have no use for the nitrates, the situation being somewhat similar to the one in which the Chilean combine, Cosach, found itself with regard to the Russian petroleum barter in the first part of 1932. (69)

The suggestion was then made that the United States War Department take the nitrates off the hands of the Farm Board, to be stored for future use in war. After a special investigation of the situation on the part of the Department, it was stated that there was no need of further stocks of nitrates in this country for war purposes. It was claimed that the stocks already on hand, together with the capacity of American plants, would be more than enough to meet even the most stringent emergency. As a protection to firms selling nitrates for agriculture, it was proposed that the War Department take the additional nitrates (amounting to some 40,000 tons) and sterilize them, making them unfit for agriculture, in case the government should try at some future date to sell them on the open market.

(69) See page 46---Chilean-Russian petroleum exchange.

This last suggestion was flatly turned down, with a statement to the effect that such a thing "had never been done before".

A direct swap between the American agricultural coöperative societies of the wheat farmers and the Chilean nitrate producers was not possible, because there is very little nitrogenous fertilizer used by the wheat farmers; the greater part of our domestic consumption is used in the cotton fields.

All American producers of nitrates voiced their protest to the proposed exchange, as it would cut heavily into their home markets. Strangely enough, the Chilean combine Cosach also objected strongly; it was afraid that the exchange would serve to cut down its cash markets in the United States, and it could not afford to lose any cash sales. (70)

Although it has previously been shown that Chile is constantly becoming less dependent upon nitrates as a source of government revenue, the provisional government, on October 5, 1932, resolved to push export sales of nitrates in order to build up balances before taking any other steps in its plans for internal improvement. This alone would tend to show that the acclaimed "independence" of Chile from nitrates is still a myth, and that without that source of revenue there would have to be drastic curtailments in standards in the country. (71)

(70) Oil, Paint and Drug Reporter; Ag 29, '32; p. 14.

(71) Ibid. O 10, '32; p. 44.

Under a six-months modus vivendi of November 11, 1932, Argentina granted to Chile a reduction of one-half of the import duties charged against certain Chilean products, nitrate of soda being among them. Shortly afterward the commercial attaché at Buenos Aires cabled the United States Department of Commerce that all such concessions were to be revoked, the revocation to become effective on February 11, 1933. (72) Thus ended another short breathing spell, during which Chile was able to get some of its nitrates upon foreign markets.

Because of the dire situation in Chile during the first part of 1933, near-desperate measures were proposed by several of the larger companies in order to be able to lower their prices sufficiently so as to compete in general world markets. The suggestions came about during a meeting of the Lautaro Nitrate Corporation in February, that company being the liquidating agent for the Cosach combine. (73) Although the Chilean Congress was not in favor of the proposal, directors of Lautaro asked that all export taxes be called off, and that Chilean nitrates be freed from the charge of \$7.50 per ton which had been assessed in order to cover service on prior secured bonds of Cosach. In no other way, it was said, could the nitrate industry of Chile hope to survive. (74)

(72) Oil, Paint and Drug Reporter; F 20, '33; p. 14.

(73) Cosach had by this time been placed in liquidation, with provision being made for the payment of interest on its bonds. Complete discussion of this combine and its affairs will come under a separate section immediately following this discussion of the general Chilean situation.

(74) Oil, Paint and Drug Reporter; Mr 13, '33; p. 22.

THE COSACH COMBINATION:

The Compañía de Salitre de Chile, or, as it is almost universally spoken of, "Cosach", was the largest corporation ever to be formed in South America. On July 21, 1930, President Ibáñez of Chile signed the law (75) which served to create the huge combine.

The purposes for which Cosach was formed are given as follows: (76)

"1. To attend to the general interest of the industry and commerce of nitrates and by-products;

2. To attain by means of a central organization improvement of the industry and commerce of nitrates and utilization of by-products, and to favor technical and scientific investigation as well as the establishment of experimental schools and plants for this purpose;

3. To carry out the propaganda, sale and distribution of nitrate and its by-products;

4. To facilitate transportation and handling of all products related to the nitrate industry, as well as articles required by the industry;

5. To centralize the acquisition of articles and merchandise referred to immediately above, giving preference to Chilean products;

6. To survey, acquire and exploit nitrate lands; to acquire and operate nitrate plants; to market the products

(75) Chilean Law Number 4863, of July 21, 1930.

(76) From the DIARIO OFICIAL for July 21, 1930. Reproduced in English in the Bulletin of the Pan American Union for May, 1931; pp. 515-16.

manufactured, and to enter into any kind of contracts for the production, exploitation, sale, consignment, transportation and freightage of nitrate and by-products, and in general any contracts related directly to the industry and commerce of nitrate and the attainment of all other objectives established under the present law."

The Anglo-Chilean's contribution to Cosach of the right to use its Guggenheim Process was the largest single item of investment in the combine. The formation of Cosach was delayed for some time because of inability of the parties concerned to agree upon the price to be paid for the process. (77)

Cosach, which was organized for a period of 60 years as a stock company, was capitalized at 3,000,000,000 Chilean pesos, which amounts to about \$365,000,000 in American money. The shares were divided into Classes A and B, the amounts outstanding of which were at all times to be kept equal. There were 30,000,000 shares of 100 pesos each, of which 15,000,000 were in each class. All of the Class A shares went to the Government of Chile, in return for which the Government transferred to Cosach the title to fields estimated to contain 150,000,000 tons of nitrates. Title to other fields was kept by the Government, but it reserved the right to sell to Cosach the products of those fields at 10 pesos (\$1.21) per ton. The B shares went to the companies whose assets and liabil-

ities were taken over by Cosach. Other Class B shares were to be issued as required, with a corresponding issue of Class A shares. The Class B holders were also required to take at least 5,000,000 shares of 7% preferred stock.

The Class B holders were to elect 7 directors, and the preferred holders were to elect 1 director for a term of 1 year; the President of Chile was to appoint 4 directors for terms of 6 years each.

With the formation of Cosach, the Government agreed to exempt all of its nitrate and iodine from the export tax, and also agreed to exempt its dividends from taxation. The income tax of the company was fixed at 6%. In return, Cosach guaranteed the Government dividends of from 140,000,000 to 186,000,000 annually over a period of four years.

The Government was to pay for its Class A shares in cash; or, if the deposits transferred to Cosach contained more than 150,000,000 tons of nitrate, by selling the excess to Cosach. (78)

Original plans for Cosach were to construct two large new plants. Because of the situation in the industry, such plans were scrapped immediately, the combine deciding to get along with plants already in existence. The schedule was also revised to provide for funding of the payments to the Chilean Government. (79)

(78) Oil, Paint and Drug Reporter; Je 2, '30; p. 21.
 Bulletin of Pan American Union; May, '31; p. 517.
 (79) Oil, Paint and Drug Reporter; Mr 9, '31; p. 44.

In the latter part of 1931, a Chilean committee made a report to the government as to their grievances in regard to Cosach. They claimed, first of all, that the corporation was unconstitutional in the first place. They further claimed that the only reason for its formation was for the paying of debts contracted by American interests in Chile because of the expensive installations of the Guggenheim process. It was also charged that lawyers' fees for the organization had been excessive. There were probably two main causes for this Chilean reaction against Cosach. The first was undoubtedly the fact that the Ibáñez government, under which the combine had been formed, had fallen from power; therefore anything associated with that government was understood to be bad for the country. The second reason was that the people in general were disgruntled over the loss of government revenue from Cosach because of the agricultural depression and poor situation in the world nitrate market. (80)

The full report of the Committee follows: (81)

"The undersigned committee believes that Law #4863 of July 21, 1930, was violated when Cosach was organized, inasmuch as its capital appears higher than that authorized, and because it considers that the sense of that law as well as the aspect under which the Government presented it and the Congress placed its approval thereon concur in

(80) Oil, Paint and Drug Reporter; N 23, '31; p. 62.

(81) Report of Chilean Governmental Commission, rendered December 5, 1931. Reproduced in English in Oil, Paint and Drug Reporter; Ja 18, '32; p. 61.

demonstrating that an equality of conditions, rights, and benefits, which do not exist at present between the Treasury and the manufacturers, constituted the immutable basis of its conception.

"Were we not oppressed by the acute financial crisis and the era of unemployment through which we are passing, and the situation of the nitrate industry were that of the year 1929-30, in which Cosach was planned, the undersigned would not hesitate the total dissolution of the Company, in accordance with the provision contained in Article 35 of the Law, for the purpose of organizing the industry on other bases.

"Excise taxes proposed for meeting in part the unemployment which this would occasion, as involving the work of extracting high-grade caliches, would in order to be capable of functioning with entire success require the organized existence of old companies, since it exists only on an extremely small scale, and the disposal of sufficient credits exceedingly difficult to obtain at the present time.

"It would doubtless have been preferable for the Treasury not to have entered as a partner into the organization that was planned, but to receive a certain share of its profits and to collect a royalty on fields transferred to it, at the same time reserving its right to take part in the management of the enterprise for the purpose of harmonizing the aims of the latter with the

general interests of the country.

"However, the fact is that it was not so done, and hence in the present situation we deem it preferable to continue Cosach, provided it be possible to confine it within the law which created it, and provided further that its debts be reduced and its contributions be revised, the same being paid exclusively in shares of stock, in such manner that distributive justice and fiscal and individual interests may be consulted and safeguarded.

"In order to confine the companies within the spirit and provisions of the Law on the basis of complete equality between the fiscal contribution and that of the companies, it would be necessary to convert into shares of stock the bonds of Cosach, except those transferred to the National City Company, which represent \$19,000,000 , and those placed in England, the Netherlands, Switzerland and Sweden, amounting to three millions of gold pounds, and further, those turned over to the Treasury, at the same time reducing proportionally the 60 pesos per ton reserved in favor of loans.

"With debts thus equitably reduced, they would not as at present overshadow the future of the industry. It is well known that those of Cosach were markedly increased by the acquisition of part of the assets of certain companies, by bonds delivered to the Treasury in payment of their quotas for the years 1932 and 1933, and by the transfer of the credit of Guggenheim Brothers against the Anglo-Chilean for £ 5,577,724 , which should not figure in the liabili-

ties of Cosach, but in those of the Anglo-Chilean. (82)

"Payments for the assets of associated companies should have been made in shares of Series B, and, therefore, companies which received bonds in payment for their assets should exchange them for the said B shares, so conforming with the precise terms of the Law. (83) Outstanding bonds should, as we have said, be reduced to those actually taken by bankers, which do not exceed \$34,000,000 , and to those turned over to the Treasury.

"In their effort to relieve the industry, Señores Cabero and de Castro would agree to the elimination of the latter.

"If possible, the contributions of the companies, subsidiary companies included, should be revised, for the purpose of adjusting their valuations to their respective actual values, or of verifying figures already accepted for companies incorporated in Cosach, eliminating in lieu thereof the subsidiary companies, which would continue as

(82) The debt to Guggenheim Brothers referred to is for the most part made up of payments for the use of the Guggenheim process for the refining of caliche. It will be remembered that Guggenheim Brothers transferred the process to the Anglo-Chilean, in which they owned the majority of stock. The Anglo-Chilean in turn, upon entering Cosach, contributed the process to the combine. Leaving out of the question whether or not the process was transferred at a fair valuation, it will be seen that the Guggenheims had a legitimate claim against the Anglo-Chilean. Upon the entrance of the latter into Cosach, the combine took over all the assets and liabilities---including, presumably, the claim of the Guggenheims.

(83) This was clearly an infraction of the Law, as it was specifically stated that all assets taken over should be paid for by Class B shares of stock.

independent companies, Article 39 of the Law being modified and their stockholders thus rehabilitated.

"Were either of these two courses adopted, the fiscal contribution would be reduced or increased until it equalled that of the individual companies, so that there would be as many A shares as B shares.

"The interest of Cosach would be better harmonized with national interests by requiring the former to designate within the period of ten years the fields which it desires reserved and to which Articles 11 and 12 of the Law refer. These fields having been selected, the Government would be at liberty to dispose of the others, transferring them upon terms agreed upon to persons who apply for them, provided the activities of Cosach are not affected thereby.

"Without prejudice of the foregoing, the Government would be able, in return for certain royalties, at once to transfer to independent companies fiscal fields adjacent to their present holdings, provided the said fields were not commercially exploitable by Cosach.

"It is necessary to modify the application of Article 39 of the Law in such a manner as to insure the right of the independent companies to operate and to guarantee the payment of expenses common to the entire industry.

"It would be advisable for Cosach to distribute its works, so that the ports of Tocopilla, Iquique, Antofagasta and Taltal would be assured of nitrate and the working

population employed in the same would be increased. For the purpose of effecting this advantageous distribution, it should be arranged that two works should operate in Iquique, two in Tocopilla, two in Antofagasta, and one at least in Taltal.

"It appears preferable in these circumstances and in order not to increase the stocks, to suspend manufacturing in María Elena, substituting for the same extraction by an equal number of workers in high-grade caliche.

"We make this recommendation without committing ourselves concerning the primacy of one or another process of manufacture, since sufficient data relative to the superior efficacy of the Guggenheim Process do not as yet exist. Only now an experimental plan is being outlined in fields cubed for the Shanks system, which will be worked by the Guggenheim method, for the purpose of determining accurately the coefficient of both yields. Such an experiment alone will enable us to estimate rationally the value of the Guggenheim patent in its double aspect of coefficient of exploitation and development of the fields.

"We would also recommend reduction in the high salaries which the companies pay their directors and higher officials, which are out of proportion to the present situation, and review of accounts submitted for heavy expenses of organization of Cosach.

"Finally, in view of the structure of this vast enter-

prise and in order that the interests of the Treasury, the owner of all its shares of Series A, may be effectively and properly considered, not only in the General Directorate of Cosach, but in all its committees, it should include the representatives of the Government in sufficient numbers, clothed with the power to veto any of its agreements prescribed in Article 20 of the Law.

"Before signing, Sr. Cabero stated that in his judgment the unemployment which might result in case negotiations were broken off and Cosach dissolved could be avoided by beginning immediately the construction of the section adjacent to Antofagasta of the railroad to Salta, and by granting fiscal subsidies to companies which desired to operate independently.

Santiago...December 5, 1931 (Signed)

In spite of the obvious prejudice which is shown in the report against the American capitalists in Chile, it must be admitted that the proposals of the Committee seemed to be the only avenue of salvation for the nitrate industry of Chile. The report seems to show a profound realization of the problems involved, and a sincere desire to find the best way out---the fact that the report is sincere is proven by the statement that some of the members would even be willing to convert the Government-held bonds into shares of stock. However, there still remains the fact that Chileans always have been trying, and always will try, to take over in some manner the interests of the Americans in Chile.

In the latter part of 1930, Cosach tried to float a loan of \$100,000,000 among the American bankers. This loan was vigorously combatted by the President of the Chemical Foundation. (84) He said that American savings should not be placed in that undertaking, because, according to him, there was an understanding between the Chilean producers and the German synthetic manufacturers, which understanding was said to be in the nature of a combination against American industry. (85)

Failing to get additional loans in sufficient quantity, Cosach found itself face to face with a crisis on July 1, 1932. On that day, its obligations to its bankers came due; and it did not have the money with which to pay. In order to avoid dissolution or bankruptcy of the organization, successful negotiations were carried out for a year's extension of credit---an extension which served to put off for a time the failure of the combine. (86)

(84) Mr. F. P. Garvan, President of the Chemical Foundation. On December 22, 1930, Mr. Garvan sent a letter to 5,000 bankers in the United States, urging them not to so use the savings that the American people had entrusted to their care. December 23, a similar letter was sent to members of Congress and to high government officials in Washington.

Oil, Paint and Drug Reporter; D 29, '30; p. 21.

(85) It has been mentioned before that the United States was not a party to the agreements and cartels between the Chilean and European producers. Likewise, the American market did not figure in any of the quotas that were established by the cartels. It would be hard, therefore, to see in what way the agreements could be interpreted as combinations against American industry. America is not a great exporter of nitrates, and it was perfectly possible for home producers to compete here with the Chilean and European products, even as they did before the international agreements referred to by Mr. Garvan.

(86) Oil, Paint and Drug Reporter; J1 4, '32; p. 51.

The situation in which Cosach found itself in July of 1932 was, as we have said, the result of its credit having given out in world markets. The American loan of one hundred million dollars, referred to on the previous page, was finally raised in February of 1931; but instead of being for \$100,000,000 it was merely for \$34,000,000; and instead of being raised entirely in the United States, European bankers had to be called in to take part of it. This loan, of course, was in addition to the \$32,000,000 bond issue of 1929. (87) This new loan of \$34,000,000 was secured by a deposit by Cosach of 60 pesos for each ton of nitrate exported. At this time there was no government export tax, and Cosach could afford to pay the deposits to guarantee its obligations. (88)

In 1932, when it was obvious that Cosach would not be able to meet its obligations, there were protective committees formed of the creditors and security holders of Cosach, Lautaro, and Anglo-Chilean. One committee represented the British bankers, and the other represented the Americans. It was the purpose of these committees to represent their clients in considering any kind of reorganization scheme for Cosach, which was then understood to be on its last legs. During the interim before reorganization could take place, the committees did their best to protect the interests of the bond-holders and creditors. (89)

(87) See page 44.

(88) Oil, Paint and Drug Reporter; Mr 20, '33; p. 53.

(89) Ibid. My 23, '32; p. 40.

In May of 1932, a new committee was appointed by the Chilean Senate to make a complete investigation of Cosach. The following results were to be determined: (90)

1. Whether the maintenance of Cosach was compatible with the national interest.
2. Whether it was compatible with the interest of the Government as a stockholder.
3. If not, whether it was advisable to continue it.
4. If Cosach was considered favorably, how was it to be financed?
5. If it proved impossible to maintain it, how could the nitrate industry be supported?
6. How could the companies not in Cosach be helped?
7. What other action could be taken to restore the nitrate industry to a profitable basis?
8. What policies could be adopted to continue the industry and better the nitrate situation?

All such committees and investigations were nearly made worthless by the overthrow of the Montero government and seizure of power by a Socialist junta led by Carlos Dávila, on June 4 of 1932. Dávila was in favor of complete dissolution of Cosach, with a return to competitive selling of nitrates. He did succeed in closing down some of the Guggenheim plants and reopening some Shanks plants, both to give more employment and to cut down the cost of production by doing away with interest charges on the advanced process. It was claimed that such a procedure would

cut the cost of production by \$4 per ton. (91) However, the government of Dávila fell before he could carry out many of his plans---and Cosach continued on.

The long-heralded reorganization of Cosach was finally agreed upon in August of 1932---and the creditors were left out in the cold. The new plan called for the setting up of a capitalization of \$100,000,000 with \$50,000,000 in bonds secured by the Chilean government and by a mortgage on stocks of nitrates. Creditors had previously waived claims of some \$40,000,000 in the thought that Cosach would be liquidated from sales within three years. In the reorganization, these claims of creditors were completely ignored by all concerned. (92)

In November of 1932, as part of the general reorganization scheme of Cosach, several drastic economies were instituted. Its large Pedro de Valdivia plant was closed, as it was thought that that procedure would be more economical than to continue operating it at only one-fourth of its capacity. The laborers that were thus put out of work were employed in constructions and improvements that were necessary to keep the plant in good condition.

Substantial economy in foreign exchange was effected by reducing the number of the foreign personnel, and by cutting the salaries of those who were retained. The total saving realized in this manner was estimated at close to \$300,000 per year. (93)

(91) Oil, Paint and Drug Reporter; Je 27, '32; p. 44.

(92) Ibid. Ag 15, '32; p. 16.

(93) Ibid. N 28, '32; p. 17.

Sr. Arturo Alessandri returned from an enforced exile to take over the Presidency of Chile on December 24, 1932. From its very inception, he had been radically opposed to Cosach, and had favored its dissolution. However, upon his return from exile, he watched things go from bad to worse in the Chilean nitrate industry; and he then agreed that reorganization would be better than complete dissolution, in order to prevent dire unemployment in the nation. The Cabinet of the previous Government had agreed to finance the combination until December 31---all financing after that date falling to the lot of Alessandri. Even before his assumption of office, he announced that he would refuse to sanction an internal loan by American and British financiers to Cosach, the loan to be secured by nitrate stocks held in Chile. (94) Evidently he believed that the credit of Cosach was still good in world markets. In a way, Chile had the foreign bankers by the throat, as will be seen by the following.

Alessandri was right in his belief that Cosach could negotiate another loan in foreign countries. During January of 1933, it arranged to borrow £ 400,000 from several large banking firms. The bankers could do nothing else but grant the loans, as about half of the money was to be used to settle charges pending abroad, made up for the most part of warehousing charges on nitrates---the same nitrates which formed the securities for prior loans to Cosach by this same group of bankers. Thus, in order to protect

(94) Oil, Paint and Drug Reporter; N 28, '32; p. 17.....
D 19, '33; p. 62.

their previous loans, the bankers had to agree to the new borrowings. The latter were secured by stocks of nitrates and iodine, and the margin was believed by all concerned to be enough to protect the bankers from any loss. (95)

As has been said before, the Alessandri government was not in favor of Cosach; the combination was only allowed to exist in order that the employment conditions in the industry might not be too seriously affected. Finally it was decided that Cosach had outlived its usefulness; a Chilean law was approved on February 2, 1933 which provided for the appointment of a liquidating committee. The committee was empowered to transact all business of the organization, but it was to be free of all possibility of suits rising out of its actions. Its obligations were to have precedence over all obligations of Cosach previously contracted. The committee was given specific powers to:

1. Exercise the powers of the board of directors in transacting all ordinary business of the corporation;

2. Make loans or issue bonds in either Chilean or foreign currencies, either with or without the pledging of property of Cosach;

3. Conduct all banking, credit and discount operations that should be necessary, including customs and insurance operations;

4. Make all necessary contracts, the said contracts not to exceed five years in length;

5. Represent the company in legal matters with all powers of attorney and the specific power of compromise.

(95) Oil, Paint and Drug Reporter; F 6, '33; p. 15.

Although the committee might give liens on property of Cosach, it was not allowed to so encumber the Government's reserves of nitrates.

In order to divorce the committee completely from the former managers of the company, the Law stated that all former government representatives or technical experts who had assisted in the organization of Cosach, were to be barred from assisting the liquidating group. This requirement had its advantages and disadvantages, chief among the latter being the fact that no other persons could help the liquidating committee as much as could people who were acquainted with the intricate organization and problems of Cosach. On the other hand, as the combination had been formed under another government, whose policies were divergent from those of Alessandri, it was probably deemed best that all adherents of the former government be kept out of the dissolution proceedings.

The committee was directed to complete liquidation proceedings within a period of two years; the members of the committee were to be paid not more than 60,000 pesos each per year; and rules were so arranged that two of the three members would be able to transact the work of the group, thus facilitating progress.

During liquidation, Cosach could not be declared bankrupt, nor could any attachment be made against its properties, nor could any court actions be brought against it on claims arising prior to liquidation, with the exception of wage and accident claims brought in the labor

courts by workers. These prohibitions were for a period of six months, until proceedings of the committee had gotten established in workable channels. The same prohibitions were applied to the Anglo-Chilean and Lautaro companies, with the exception of such actions as might be brought against either or both of the two companies by Cosach itself. (96)

Mr. Medley Whelpley, President of Cosach, issued the following comment relative to the dissolution: (97)

"Refraining for the moment from any comment on the abruptness of the procedure adopted, which is surely unprecedented, the pretended infractions advanced as reasons for the dissolution, the apparent disregard for those foreign interests who have made prodigious efforts to assist Chile in its economic difficulties (98) and the international repercussions which a precipitate step of this nature will have on the delicate structure of future international credit, it is an indisputable fact that the liquidation of the Compañía de Salitre de Chile has now become a practical necessity.

"It would not have been difficult to reach an agreement with the principal industrialists and creditors as to the procedure that should have been adopted. But matters having reached a sudden climax in the government decree, the creditors and owners of the nitrate properties have but two choices of action:---one would be to resist the government decree, relying on their full legal rights and the protection to which they are entitled in pursuance of international comity; the other would be to protest against the principles and the violent procedure adopted, but to refrain from taking any action which might hamper the task of the proposed liquidating committee, providing that the objective of finding a harmonious solution justifies the means adopted.

"For my own part I have no doubt that the second course is preferable, as the first course would be merely dilatory and would contribute no constructive thought to the solution of one of the most complex social, financial, and industrial problems of these troublesome times.

(96) Oil, Paint and Drug Reporter; Mr 6, '33; p. 23.

(97) Ibid. Ja 23, '33; p. 19.

(98) This disregard was a continuation of a Chilean campaign to oust foreign interests from nitrate control.

"It will be noticed that the decree of dissolution does not apply to the Anglo-Chilean and Lautaro Nitrate Corporations, the apparent thought behind this being that these corporations are separate legal entities, the continued operation of which is in the national interest. For Cosach itself the objective appears to be to undo the amalgamation of some 34 companies which now constitute that corporation, a formidable, if not impossible, task. I do not, of course, speak for the creditors and owners of the properties, and it is too early to say to what extent their rights may be prejudiced. I must frankly state that it is difficult for me to understand the effect of a decree which merely repeals the routine decrees giving life to the corporation, and I have been unable so far to obtain any satisfactory legal explanation, but the opinion has been advanced in some quarters in Chile that the effect is simply that Cosach is decreed to have been a de facto corporation responsible for the contracts it has undertaken during its de facto life.

"Moreover, I consider that these measures are contrary to the deeds of organization signed, with legislative authority, by the government of Chile. The board, nevertheless, will not resist this action of the supreme government, because it wishes to avoid all possible damage to the interests entrusted to it. Consequently, the board will deliver the company to the liquidators appointed by the President of the Republic, and by the President of the Supreme Court, but, at the same time, it leaves on record that it eliminates all of its own responsibility for the immediate and future consequences of this act of the government of Chile."

This comment would seem to indicate that Mr. Whelpley, along with other foreigners in Chile, while not thinking very favorably of the liquidation plans, did not dare to come out in the open and challenge the government. It was doubtlessly feared that were such a challenge to be given, the government could find plenty ways of making life disagreeable for the foreigners. In such a country there is ample opportunity for such disagreeableness, as new governments often absolutely refuse to recognize as valid any contracts entered into by previous governments. So it will be seen that it is often politic to go along with the dictates of the government, even though not agreeing with them.

Liquidation of Cosach involved among other things the returning of the various properties to the companies which had owned them before the formation of the combine. This was an arduous task, as various liens had been placed on the properties---each one of which had to be treated in a different manner. Leaders of the companies representing the chief American and British interests in Cosach went to Chile in order to be of any assistance possible to the liquidating committee---and, incidentally, to see that their own interests were protected. (99)

It was expected in official circles throughout the world that the Chilean nitrate export tax, that was lifted in 1931 upon the formation of Cosach, would continue to be waived during the liquidation proceedings. (100) However, by a decree of March 14, 1933, the government announced that it was about to restore the tax. The reason given was that Chile was in great need of revenue, and that the tax would be necessary in order to enable the country to balance its budget. As it was doubtful whether the companies could continue to operate if they were forced to pay both the export tax and the interest on their bonds, the new move of the government was looked upon by foreign interests as virtual confiscation of the plants by the government. Further actions of the government in trying to so order the liquidation that the Guggenheim interests should be separated from the other interests, was taken

(99) Oil, Paint and Drug Reporter; F 20, '33; p. 14.

(100) It will be remembered that when the export tax was lifted, the companies were required to deposit 60 pesos per ton to secure their bonds. Under the new plan, companies had to pay both the tax and deposit.

to mean that the government was trying to crowd the Guggenheims out of the nitrate business, or at least that it was trying to wipe out all their claims against Cosach and its assets. (101) It would have also been impossible for the large British and American companies to enter into the proposed sales agreement that the government was thinking of to succeed Cosach, as the share of those companies in the profits under the agreement would not be enough to pay the interest on their obligations alone. (102) Chile had at last gotten the foreign producers just where she wanted them, even though it caused her a great national calamity to do so. True, Chile did not try to bring about the disaster in order to freeze out the foreigners; such a procedure would have been suicidal. However, she certainly took advantage of the situation to accomplish what she had been trying to do for years.

That reestablishment of the export tax was the cause of the brewing of a diplomatic breach between Chile and other countries of the world---countries in which Cosach bonds were held, bonds which were now without security. Several countries protested the failure of Chile to recognize as valid the obligations of the previous government, among them the United States, England, Germany and the Netherlands. Protests were also made by private commercial representatives of various nations. The general o-

(101) These claims of the Guggenheims were for their patent for the extraction of nitrate from caliche, referred to previously. Chile had for long been trying to wipe out these charges and start anew.

(102) Oil, Paint and Drug Reporter; F 6, '33; p. 15.

pinion was that Chile had violated a contract, and not merely broken faith. The government in taking off the tax and providing for the deposit for the bondholders, had caused foreigners to finance Cosach far more heavily than they otherwise would have done. They therefore took the new action of the government as meaning a definite break in the contract. The reply of the government was that Cosach had been formed illegally, and that there was therefore no contract, either expressed or implied. Foreign bond-holders were referred to the courts for any further satisfaction. (103)

There was talk in foreign circles of various reprisals that might be brought against Chile, in order to get the government to accept the obligations of its predecessors. Suggested means included the breaking off of diplomatic relations, abrogation of commercial treaties, tariffs against Chilean nitrate, and the confiscation of foreign stocks of Chilean nitrate as security for the obligations. The latter course would have given the world enough of a supply to last for two years---and would result in completely killing the export nitrate trade of Chile. However, none of these steps were taken; as it is always a difficult problem to get many nations to agree upon a single course of action; and without a single course of action, the reprisals would be useless.

(103) Although the foreign bond-holders were given the right to appeal to the courts, that right would do them little good, as the courts were Chilean, and under the control of the government. If the foreigners could get no satisfaction from the government, they could hope for little from the courts.

The Chilean government asked for a list that showed just who were the bondholders of Cosach. It wanted to know whether the bonds had been gotten rid of to the general public, or whether they were still held by the large banking firms; if the latter was the case, the negotiations for a settlement would be much easier than they would otherwise be.

Until the end of 1933, the government of Chile had not decided whether or not it would allow the payment of export tax in Chilean paper currency. If such a procedure was to be allowed, it would be possible for the companies in Chile to put nitrate on world markets at a considerable decrease in price, due to the current depreciation abroad of the peso.

The decree of March 14, 1933 restored to effect the Law of 1897, which provided for a tax of 3.36 pesos per metric quintal, the peso then being worth approximately 18 English pence. This tax equals about 100 pesos per ton. (104) With the depreciation of the peso, it now takes 40 of them to buy an American dollar.

Because of this depreciation, Chile imposed a surtax of 101% on all import duties, and the surtax was extended to cover the nitrate export tax. That meant that there was a tax of slightly more than 200 pesos per ton on nitrates, instead of the former deposit levy of 60 pesos.

(104) That was with the peso at par---6 pence of \$.1216 U. S. money. The official rate of exchange set by Chile is now \$.06, while the commercial rate, as mentioned above, is 40 to the dollar.

Before liquidation proceedings were brought about, the 60 pesos per ton had to be paid by the companies in gold, the amount being equal to \$7.30 per ton, and being used to cover the service charges on the bonds. If the government were willing now to accept the 200 pesos per ton tax in Chilean paper money, the total amount of the tax could be gotten under present exchange conditions for only \$5 per ton. Such a procedure would enable the producers to cut \$2.30 a ton from their prices, but it would make no allowance for the payment of interest on the bonds of Cosach. By accepting its own paper money in payment of the taxes, Chile would increase its own income for budgetary purposes, and yet not unduly burden the producing companies. If it will not agree to such acceptance of paper, there seems to be no future for the industry in the country. (105)

Plans for still another reorganization of the nitrate interests of Chile were presented to the Chilean Congress and to the nitrate interests in May of 1933. The new plan provided for a complete from Cosach and from each other of the Anglo Chilean and Lautaro Companies, and it also provided for elimination of the nitrate export tax which had been fought so bitterly by the producers. The government was to form a new sales organization to handle all export sales of nitrates. The organization would buy all nitrate from producers at a price figured on cost plus \$1.50 per

(105) Above discussion of export tax adapted from article in Oil, Paint and Drug Reporter for April 10, 1933.

ton. Lautaro and Anglo-Chilean would under the proposed plan get two-thirds of the sales quota for the country, and the remainder would be divided among the smaller companies, represented by the National Nitrate Company. The government would receive its tax from the first 25% of the profits of the sales organization, the remaining 75% to be given to the producing companies. Out of this they would pay charges on \$57,000,000 worth of new bonds which would be issued in exchange for certain bonds of Cosach. The sales organization would acquire all stocks at present in the country, at a price of 3 English pounds per ton.(106)

This new plan was not accepted by the officials of Anglo-Chilean and Lautaro until January of 1934, when it was voted by the two companies to take part in the government selling scheme. The plan will not be final until it is submitted to a vote of the bond-holders, which has not as yet been done (February, 1934). As a part of the same plan, the President of Chile has recently signed a decree which gives the Chilean Nitrate Iodine Sales Corporation a 35-year monopoly on the sale of nitrates. (107) There is no telling how long this monopoly will last, before the government changes its mind and decides to do something else with nitrates.

We thus have the Chilean situation with Cosach not as yet liquidated, but its successor ready to carry on as soon as formalities are completed.

(106) Oil, Paint and Drug Reporter; My 15, '33; p. 59.

(107) LA PRENSA, New York; Jn 26, '34.

UNITED STATES

The estimated production of nitrogen in the United States is shown by the following table: (108)

TABLE IXSHORT TONS OF NITROGEN PRODUCTION IN THE U. S. A.

<u>Year</u>	<u>By-product nitrogen</u>	<u>Fixed Nitrogen</u>	<u>Total</u>
1910	22,901	0	22,901
1913	39,330	0	39,330
1916	59,383	0	59,383
1919	86,960	276	87,236
1920	102,401	270	102,671
1921	73,501	200	73,701
1922	97,747	740	98,487
1923	139,550	5,910	145,460
1924	126,357	11,110	137,467
1925	123,600	13,050	136,650
1926	146,500	14,000	160,500
1927	152,000	18,000	170,000
1928	170,000	26,000	196,000
1929	187,600	84,000	271,600

Most of the nitrogen produced here in this country is of the by-product nature, as will be seen from Table IX; but since 1922 the fixed nitrogen industry has been growing by leaps and bounds. The by-products come for the

(108) Bureau of Mines Information Circular 6385, p. 16.
1910-1925, inclusive, from Ernst, Fixation of Atmospheric Nitrogen, 1928. 1926-1929, inclusive, from data compiled by Fixed Nitrogen Research Laboratory.

most part from by-product coke ovens, only a small portion coming from the coal-gas plants. (109)

In 1928 there were in the United States only four plants for the fixation of nitrogen from the air: being located at Hopewell, Virginia; Syracuse, New York; Belle, West Virginia; and Niagra Falls, New York. The plant of the Atmospheric Nitrogen Corporation at Hopewell was the largest, with an annual capacity of 30,000 tons of nitrogen. The capacities of the other three plants in tons per year were respectively 12,000; 12,000; and 4,000. (110) The Nitrogen Corporation plant at Hopewell (which company, by the way, is a subsidiary of the great Allied Chemical and Dye Corporation) was equipped for the production of ammonia and synthetic nitrate of soda. (111) The first unit of the plant, completed in 1928, represented an outlay of \$30,000,000; in 1930 the company planned for a second unit, costing \$20,000,000---which would double the capacity; and the ultimate expenditure for the plant was reported to be set at about \$150,000,000. (112)

Another great entry into the American field of nitrogen fixation came in 1929, with the establishment at Long Beach, California of a plant of the Shell Chemical Company, which was a unit of the Shell Development Company---which in turn was a subsidiary of the Shell oil interests. The plant, which was the largest of its kind in the West, represented a proposed ultimate investment of \$5,000,000.

(109) Bureau of Mines Info. Circular 6385, p. 16.

(110) American Year Book for 1928.

(111) Oil, Paint and Drug Reporter; D 10, '28; p. 51.

(112) Ibid. Mr 31, '30; p. 45.

The Shell company uses late German patents for the fixation of the nitrogen, and the process is carried through with electric power. (113)

In 1930 the American output of synthetic ammonia by means of fixation was at the rate of about 500 tons of anhydrous ammonia per day. At that time, the capacity of present plants, plus that of those under construction or immediately projected, amounted to 360,000 tons per year, an investment of approximately \$75,000,000. (114)

The huge Muscle Shoals plant erected by the American Government during the latter part of the War to produce nitrates for war purposes has lain idle for years, with its machinery deteriorating and depreciating in value. The bill signed by the President on May 18, 1933 provided for the use of the facilities there.

Aside from electric power production, the experimentation with fertilizers is the outstanding peace-time feature of the bill as signed. In order to cheapen and improve the production of fertilizers, the board (115) was authorized to manufacture and sell fixed nitrogen fertilizers produced either by using the present equipment in its present condition, by modernizing that equipment, or by installing any other equipment or processes as it may believe necessary. The board was also authorized to operate laboratories in which to experiment with different

(113) Oil, Paint and Drug Reporter; S 30, '29; p. 21.

(114) American Yearbook for 1930; p. 686.

(115) The TVA---Tennessee Valley Association.

kinds of fertilizers, and authorized to donate fertilizers to agricultural agencies for the purpose of experimentation with results.

Provision was made for the use of so-called plant #1 for the manufacture of nitrogen; and provision was made that in case plant #2 was not at present so needed, it should be kept in stand-by condition for war use, unless directed by Congress to the contrary..

Within one year after the passage of the act, the President was authorized to lease the nitrate equipment to any reputable farm organization or corporation organized by such, at a rental of not less than \$1 per year, on the stipulation that the plants will be used only for the manufacture of fertilizers. (116)

EXPORTS of fertilizers from the United States in 1928 alone amounted to 1,213,900 tons; 57% going to Europe, 26% to Asia, and 16% to other parts of North America. (117)

Exports of sulphate of ammonia for the first 11 months of 1928 showed a great drop over the same period of 1927, as is shown in Table X. (118)

Table X		
Exports of Sulphate of Ammonia from United States in tons.		
Destination	1927	1928
Canada	3,119	3,063
Cuba	15,094	2,823
West Indies, Bermuda	3,678	1,055
Dutch East Indies	49,257	35,313
Japan	29,839	24,229
Philippines	13,592	12,229
Other countries	17,455	10,379
	132,034	89,093

(116) Oil, Paint and Drug Reporter; My 22, '33; p. 48A.

(117) Ibid. Je 10, '29; p. 56..(118) Ibid. Ja 21, '29; p.46.

This decline in exports was partly due to an increase in the domestic demand, thus reducing the surplus available for export purposes.

Table XI shows the exports of ammonia sulphate from the United States for the years 1920-1933: (119)

Table XI

EXPORTS OF AMMONIA SULPHATE FROM THE UNITED STATES

<u>YEAR</u>	<u>TONS</u>	<u>DOLLAR VALUE</u>
1920	17,489	\$2,264,387
1921	65,915	7,620,130
1922	168,077	8,720,775
1923	144,645	9,805,417
1924	130,902	8,918,536
1925	103,282	5,654,682
1926	143,666	7,989,048
1927	195,766	10,137,340
1928	103,275	4,845,399
1929	104,117	4,817,394
1930	134,543	5,453,839
1931	66,902	2,220,265
1932	14,742	408,146
1933	14,328	362,426

(119) Figures from 1920-1930 from Oil, Paint and Drug Reporter for F 26, '31; Figures for 1931, 1932 from FOREIGN COMMERCE AND NAVIGATION OF THE UNITED STATES for the respective years; Figures for 1933 from the MONTHLY SUMMARY OF THE FOREIGN COMMERCE OF THE UNITED STATES FOR DECEMBER OF 1933.

Because of the scare in some parts of the population of a war with Japan, the rumor began to circulate during the early part of 1933 that the United States Government was keeping close watch over all shipments of nitrates from the States to Japan. The Treasury and State Departments strongly denied that such was the case, although it was admitted that the collector of customs for the Virginia district was keeping a strict check on such shipments. Such a check, it was stated, would only be made a matter of official procedure in the case of an embargo on munitions. Nitrate of soda, over which the question arose, has no official classification as such in export statistics, being included under "All other nitrogenous fertilizers"; although it is probable that soda nitrate makes up the greater part of the classification.

Total exports of nitrates from the United States under this classification in 1932 amounted to 166,981 long tons, with a value of \$4, 357, 343. Of this total, Japan received only 14,617 tons directly, the remainder going for the most part to France. Taking this fact into consideration, there would seem to be no fears justified of her receiving from us an unjustifiable amount of nitrates which might be used against us in time of war. These fears are made still more groundless when we consider that Japan is in great need of nitrates for agricultural purposes. (120)

(120) Oil, Paint and Drug Reporter; Mr 13, '33; p. 16.

Although this country exports considerable quantities of nitrates, the net balance is very strongly on the side of IMPORTS.

Table XII shows the total imports of nitrogen into the United States for the years 1910 to 1929 inclusive.

Table XII (121)

<u>Total Imports of Nitrogen into U. S.----short tons.</u>				
1910	112,039	:	1923	168,095
		:		
1913	128,235	:	1924	185,796
		:		
1916	221,705	:	1925	223,764
		:		
1919	84,239	:	1926	199,400
		:		
1920	260,529	:	1927	191,400
		:		
1921	69,662	:	1928	269,000
		:		
1922	101,774	:	1929	239,500

The following tables will show the extent to which the various nitrogenous substances were imported into the country during specified years.

Table XIII (122)

<u>Imports of Calcium Nitrate (Nitrate of Lime)</u>		
<u>Year</u>	<u>Quantity in tons</u>	<u>Value in Dollars</u>
1924	9,496	\$379,580
1925	7,555	346,285
1926	11,655	500,286
1927	16,999	774,912
1928	23,373	999,947
1929	30,709	1,260,067
1930	47,233	1,697,009

(121) Bureau of Mines Information Circular 6385; p. 19.

(122) Oil, Paint and Drug Reporter; F 26, '31; p. 15.

Table XIV (123)United States Imports of Nitrate of Soda

<u>Year</u>	<u>Quantity in tons</u>	<u>Value in Dollars</u>
1871	25,145	\$1,254,961
1881	49,171	2,356,167
1891	104,813	2,929,760
1901	197,518	5,656,442
1913	586,315	20,713,375
1914	554,048	17,926,165
1915	575,371	16,240,510
1916	1,072,833	32,129,926
1917	1,261,993	44,428,196
1918	1,608,569	70,077,674
1919	1,410,714	68,229,548
1920	907,141	40,314,969
1921	833,756	42,322,979
1922	303,271	14,067,668
1923	897,198	43,062,754
1924	951,904	45,649,327
1925	1,104,808	51,952,270
1926	1,020,444	47,444,919
1927	648,689	28,891,712
1928	1,093,761	40,208,362
1929	962,762	35,110,524
1930	692,592	26,471,945

(123) Oil, Paint and Drug Reporter; F 26,'31; sect.p.15ff.

For 1932, 1933: See p. 83A.

Figure IV
(see Table XIV)
p 83



UNITED STATES IMPORTS OF NITRATE OF SODA, expressed in tons and dollars.

Figures from 1871-1930 from Oil, Paint and Drug Reporter for February 26, 1931.

Figures for 1931, 1932 from FOREIGN COMMERCE AND NAVIGATION OF THE UNITED STATES for the respective years.

Figures for 1933 from THE MONTHLY SUMMARY OF THE FOREIGN COMMERCE OF THE UNITED STATES for December, 1933.

Table XV (124)United States Imports of Sulphate of Ammonia

<u>Year</u>	<u>Quantity in Tons</u>	<u>Value in Dollars</u>
1891	9,950	\$483,196
1901	14,846	694,454
1913	61,113	3,660,064
1914	83,597	4,900,058
1915	64,417	3,215,139
1916	19,404	1,371,007
1917	8,176	647,271
1918	3,983	467,999
1919	1,964	288,469
1920	2,586	343,107
1921	2,537	226,300
1922	6,356	314,269
1923	1,879	121,673
1924	5,851	337,032
1925	21,188	1,198,428
1926	13,340	724,067
1927	3,470	205,568
1928	33,201	1,474,305
1929	33,128	1,423,081
1930	8,092	283,667

(124) Oil, Paint and Drug Reporter; F 26, '31; sect.p.15ff.
 For 1931, 1932 and 1933: See graph on page 84A.

Figure V
(see Table XV)
(p 84)



UNITED STATES IMPORTS OF SULPHATE OF AMMONIA, expressed in tons and dollars.

Figures from 1891-1930 from Oil, Paint and Drug Reporter for F 26, '31.

Figures for 1931, 1932 from FOREIGN COMMERCE AND NAVIGATION OF THE UNITED STATES for respective years.

Figures for 1933 from MONTHLY SUMMARY OF FOREIGN COMMERCE OF THE UNITED STATES for December, 1933.

Note comparative fluctuations of tonnage and prices.

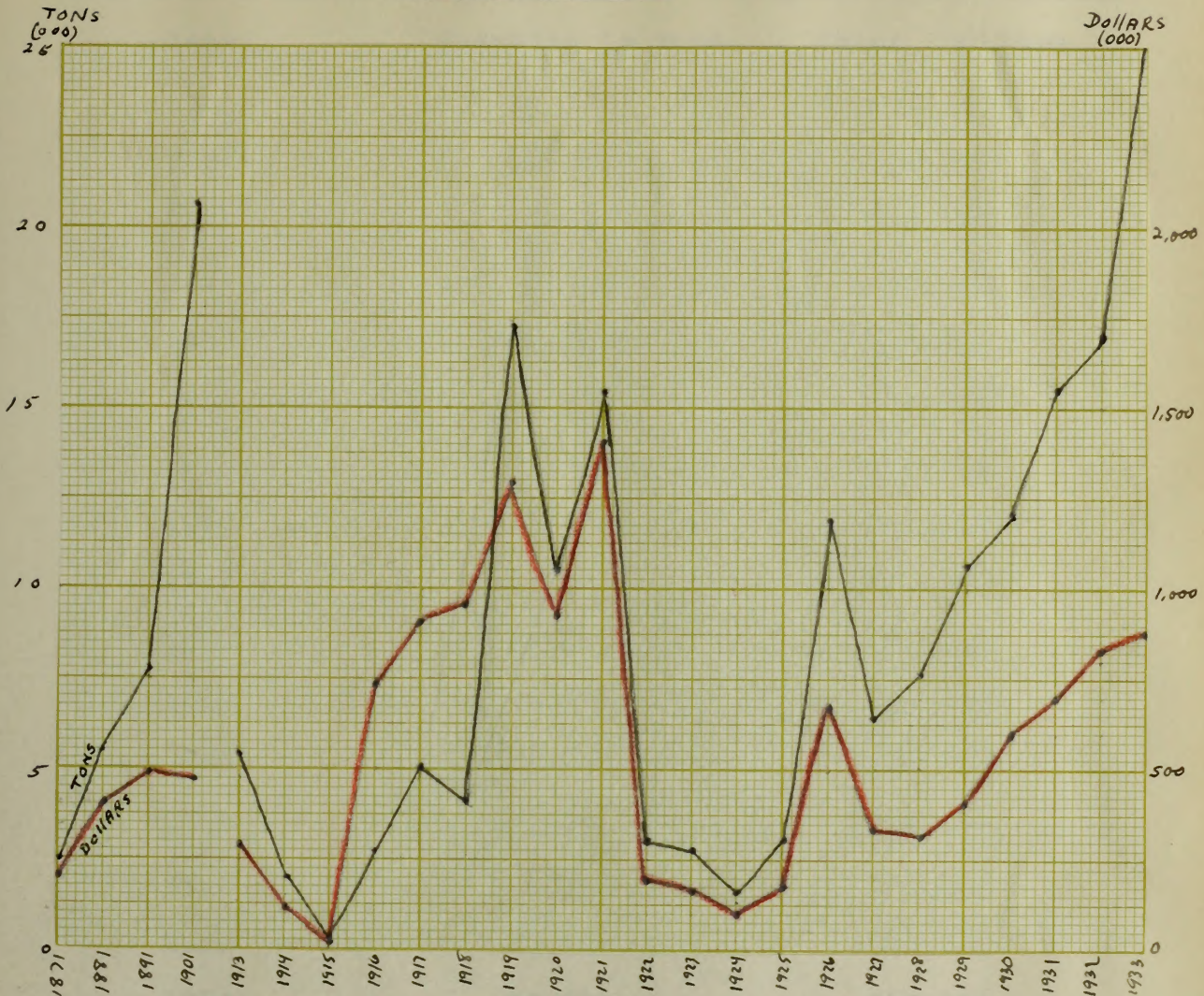
Table XVI (125)

United States Imports of Crude Saltpeter, Quantities
Stated in Pounds prior to 1924, and in Tons Thereafter.

Year	Quantity	Value, Dollars
1871	5,072,381 lbs.	\$208,423
1881	11,014,226 "	414,630
1891	16,090,486 "	494,121
1901	41,343,897 "	473,578
1913	10,989,382 "	288,995
1914	3,547,252 "	115,470
1915	677,785 "	22,483
1916	5,412,130 "	734,123
1917	10,171,654 "	904,506
1918	8,715,327 "	956,853
1919	34,557,048 "	1,298,391
1920	20,862,012 "	929,045
1921	30,868,786 "	1,407,044
1922	6,208,779 "	189,569
1923	5,581,009 "	168,410
1924	1,600 tons	102,017
1925	3,235 "	179,095
1926	11,869 "	675,134
1927	6,468 "	333,095
1928	7,692 "	322,710
1929	10,668 "	403,243
1930	12,104 "	599,068

(125) Oil, Paint and Drug Reporter; F 26, '31; sect.p.15ff.
For 1931, 1932 and 1933: See graph on page 85A.

Figure VI
(see Table XVI)
(p 85)



UNITED STATES IMPORTS OF CRUDE SALTPETER, in tons and dollars.

Figures from 1871-1930 from Oil, Paint and Drug Reporter for F 26, '31.

Figures for 1931, 1932 from FOREIGN COMMERCE AND NAVIGATION OF THE UNITED STATES for respective years.

Figures for 1933 from MONTHLY SUMMARY OF FOREIGN COMMERCE OF THE UNITED STATES for December, 1933.

Table XVII (126)United States Imports of Guano

<u>Year</u>	<u>Quantity in Tons</u>	<u>Value, Dollars</u>
1871	94,345	\$3,313,914
1881	23,452	339,552
1891	11,162	194,167
1901	3,122	23,762
1913	16,462	313,891
1914	21,853	754,727
1915	20,950	534,371
1916	15,732	425,210
1917	3,563	73,394
1918	10,663	308,268
1919	8,218	293,425
1920	18,796	1,550,098
1921	37,578	3,158,064
1922	1,305	48,675
1923	22,883	912,240
1924	22,940	869,304
1925	24,553	737,896
1926	17,855	692,124
1927	20,579	834,447
1928	17,991	778,628
1929	39,968	1,964,465
1930	35,858	1,593,512

(126) Oil, Paint and Drug Reporter; F 26,'31; sect.p.15ff.
 For 1931, 1932 and 1933: See Graph on page 86A.

Figure VII
(see Table XVII)
p. 86



UNITED STATES IMPORTS OF GUANO, by tons and dollars.

Figures for 1871-1930 from Oil, Paint and Drug Reporter for F 26, '31.

Figures for 1931, 1932 from FOREIGN COMMERCE AND NAVIGATION OF UNITED STATES for the respective years.

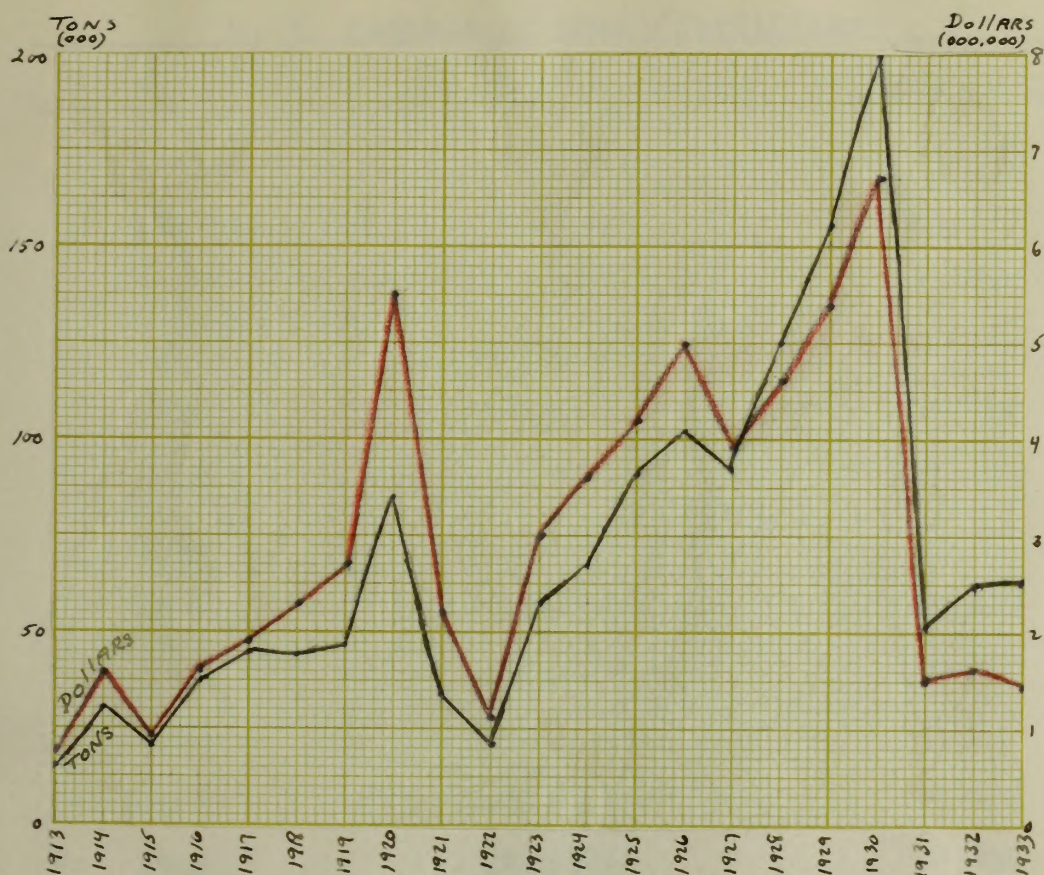
Figures for 1933 from MONTHLY SUMMARY OF THE FOREIGN COMMERCE OF THE UNITED STATES for December, 1933.

Table XVIII (127)U. S. Imports of Calcium Cyanamid (Lime Nitrogen)

<u>Year</u>	<u>Quantity in Tons</u>	<u>Value, Dollars</u>
1913	14,656	\$777,774
1914	29,536	1,590,004
1915	20,564	919,574
1916	38,023	1,633,366
1917	44,146	1,951,104
1918	43,070	2,297,475
1919	46,149	2,705,475
1920	84,678	5,534,716
1921	34,702	2,243,450
1922	21,643	1,111,375
1923	57,678	3,086,271
1924	67,715	3,611,887
1925	90,761	4,252,918
1926	102,052	5,055,086
1927	92,153	3,977,599
1928	125,907	4,597,957
1929	155,980	5,409,892
1930	200,035	6,692,292

(127) Oil, Paint and Drug Reporter; F 26, '31; sect.p.15ff.
 For 1931, 1932 and 1933: see graph on page 87A.

Figure VIII
(see Table XVIII)
(p 87)



United States Imports of Calcium Cyanamid, in tons and dollars.

Figures from 1913-1930 from Oil, Paint and Drug Reporter for F 26, '31.

Figures for 1931, 1932 from FOREIGN COMMERCE AND NAVIGATION OF THE UNITED STATES for the respective years.

Figures for 1933 from the MONTHLY SUMMARY OF THE FOREIGN COMMERCE OF THE UNITED STATES for December, 1933.

Table XIX (128)U. S. Imports of Urea (Fertilizer)

<u>Year</u>	<u>Quantity in Pounds</u>	<u>Value, Dollars</u>
1914	17,981	\$8,798
1915	65,464	31,994
1916	79,172	32,498
1917	56,429	36,248
1918	22,777	17,479
1919	11,576	7,693
1920	18,693	10,784
1921	7,714	5,349
1922	136,161	34,953
1923	195,208	40,275
1924	66,318	9,642
1925	101,291	12,406
1926	302,783	27,308
1927	657,243	43,591
1928	768,438	47,508
1929	2,994,430	159,956
1930	5,388,967	262,293

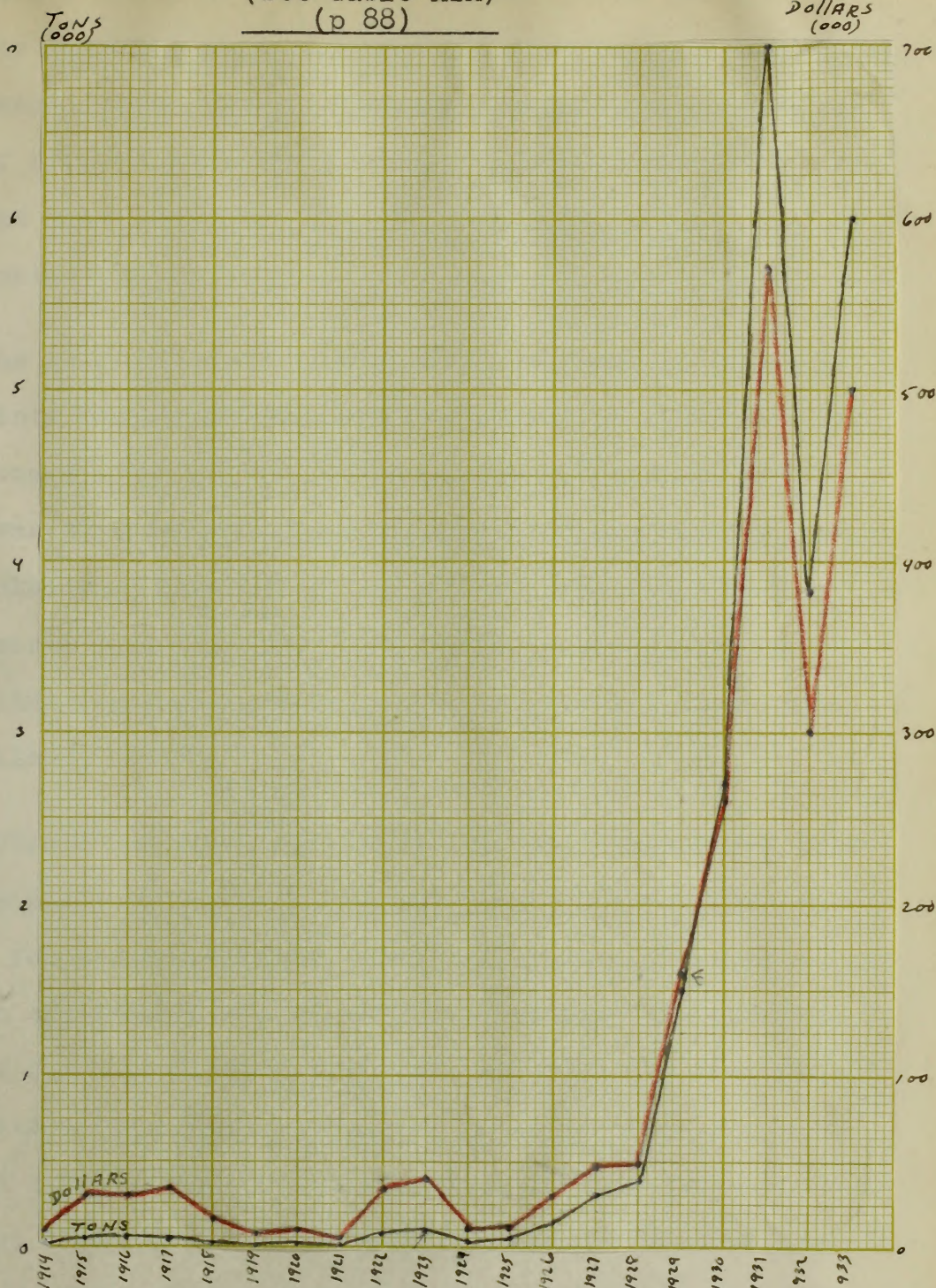
(128) Oil, Paint and Drug Reporter; F 26,'31; sect.p.15ff.

This table shows the highly concentrated value of urea, which is used in the manufacture of less concentrated fertilizers.

Also there should be noted the drop in price which occurred in the year 1922, when a great increase in volume resulted in only a small increase in value.

For 1931, 1932 and 1933: See graph on page 88A.

Figure IX
(see Table XIX)
(p 88)



UNITED STATES IMPORTS OF UREA, in tons and dollars.

Figures from 1914-1930 from Oil, Paint and Drug Reporter for F 26, '31.

Figures for 1931, 1932 from FOREIGN COMMERCE AND NAVIGATION OF THE UNITED STATES for the respective years.

Figures for 1933 from MONTHLY SUMMARY OF THE FOREIGN COMMERCE OF THE UNITED STATES for December, 1933.

During 1932, an American firm was given the sole right to import genuine Peruvian bird guano into the United States. There was an agreement made with the government of Perú whereby the American firm was enabled to import the guano in cargo lots for unloading at either Gulf or Atlantic ports. (129)

The year 1932 also saw a great increase in the imports into the United States of sulphate of ammonia. This nitrogenous material, by a combination of circumstances, (130) was then so low in price that American farmers could, by purchasing it, get from 50 to 100% more nitrogen for their money than they could by buying Chilean nitrate of soda. Imports during this period came mostly from Japan and Holland. (131)

DUMPING charges were brought against cargoes of European sulphate of ammonia for the first time in 1931, although for a long time the American authorities were unable to definitely prove dumping. However, the charges brought serious inconvenience to importers, as the customs authorities required the posting of an anti-dumping bond on each shipment taken into the country from the suspected nations. This bond had to be large enough to insure re-export or the payment of a special dumping duty in case it was later found that there really was dumping. While the cost of the bonds in themselves was low, the agricul-

(129) Oil, Paint and Drug Reporter; J1 4, '32; p. 51.

(130) The most important of the circumstances were the breakdown of the European nitrogen cartel and the depreciation of the Japanese yen.

(131) American Year Book for 1932; p. 734.

turists of the South began to complain bitterly that the steel trust, manufacturers of nitrogen in this country, were attempting to keep up prices of fertilizers, and to place an added duty upon imports. (132)

The American Iron and Steel Institute, which was the organization which instigated the anti-dumping proceedings in 1931, later withdrew from the scrap; but the investigations were continued by the government. In August of 1932, definite findings of dumping of sulphate of ammonia from Germany, Belgium and Poland were made by the Secretary of the Treasury. The findings stated that home producers were very likely to be injured by this selling of the foreign product here at less than its fair value. Further investigations were made to determine just what would be a fair value for the imports; and in the interim, all importers from those countries were forced to file bonds. Things finally got into such a position that buyers were afraid to purchase, for fear that they would be charged a dumping penalty. Dutch producers got around that timidity by selling their product here with a guarantee against any dumping penalty. (133)

Dumping allegations were made against Dutch sulphate of ammonia in 1933, but were held to be groundless. (134) Investigations are still pending as regards the product of several other countries. (June, 1933)

(132) Oil, Paint and Drug Reporter; Ag 10, '31; p. 17.

(133) Ibid. Ag 22, '32; p. 15.

(134) Ibid. F 27, '33; p. 15.

THE RELATIONS OF THE GOVERNMENT AND THE INDUSTRY have for the most part been cordial, very little interference having been indulged in by the Federal authorities.

The government intervened in the matter of prices of fertilizers in 1920, under the authority of the Lever Food Control Act. It was claimed in December of that year that the prices being quoted by manufacturers for the spring of the next year were much too high, and that they should be materially reduced. Prices of farm products in general were in the declining stage following the boom of war years, and farmers could not afford to pay such high prices for fertilizers. The high prices in 1920 resulted in curtailment of acreage and in reduction of yield per acre that was planted. (135)

In a case that was finally decided by the United States Supreme Court on February 6, 1933, the Anglo Chilean Nitrate Sales Corporation was awarded a decision over the State of Alabama. Alabama had tried to tax the corporation under a state law which stated that foreign corporations must register and pay an annual tax of \$2 for each \$1,000 worth of capital employed in the state. The only capital which the corporation owned in the state was its stock of nitrates, which were stored in a public warehouse in Mobile, and which were sold for cash by a traveling salesman working on commission for the head office in New York. The Alabama Supreme Court classified such procedure as do-

ing business in the state, and so taxed the corporation. The majority opinion of the United States Supreme Court was that the company was not doing a local business in the state, and consequently the only thing that the state could tax would be the imported nitrate; however, that would be a tax on foreign commerce, which is forbidden to the states by the Constitution. The dissenting opinion of the Court agreed with the State Court, saying that there was nothing to stop the corporation from selling broken bags of nitrate, and thus doing a local business in the State of Alabama. (136)

In May of 1933 a request was filed by a Baltimore company against the granting of loans by the Regional Agricultural Credit Corporation at Albany, New York to farmers in Maine who bought their fertilizers from manufacturers in Canada. (137) The company claimed that such loans served to keep Canadian plants running and American plants idle, thus completely defeating their purpose. The letter requested that the matter be presented to the Reconstruction Finance Corporation, which supplied the money for the loans, and requested that the Corporation prohibit the use of such agricultural loans for expenditure in any but American plants. (138)

When the National Industrial Recovery Act, known as the NIRA, was contemplated by government officials in 1933,

(136) Oil, Paint and Drug Reporter; F 13, '33; p. 54.

(137) Filed with U. S. Senator Millard Tydings.

(138) Oil, Paint and Drug Reporter; My 29, '33; p. 53.

the Fertilizer Recovery Committee, or FRC, was organized by the industry on June 1. The purpose of the FRC was to coördinate the efforts of the fertilizer industry with the general recovery plans of the National Government. Economic and ethical aspects of the industry were to be so coördinated so as to enable the members to formulate their code of practices as required by the Government. (139)

During the past few years, the Government has had to decide priority claims on many patents and inventions that have been presented to it, but there has been only one such patent that has had great importance for the American nitrate industry---and that was a patent for a synthetic ammonia catalyst process, invented by an employee of the Atmospheric Nitrogen Corporation.

The new process consisted of the passing of the gases to be synthesized into contact with liquid anhydrous ammonia before entry into the catalyst chamber. The process was conceived in 1919, and was reduced to practice in 1921. A patent was applied for in 1923. Application for a patent on a similar process was made by another person in 1921, which was taken as the date of conception. The second person admitted that the other patent was discovered first, but claimed that the company had been delinquent in reducing it to practice. The corporation claimed that it had to wait for the completion of its new plant to reduce the invention to practice, and the courts in 1929 decided that the Atmospheric Corporation had NOT been delinquent, Thus granting it the patent. (140)

(139) Oil, Paint and Drug Reporter; Je 19, '33; p. 48.

(140) Ibid. D 30, '29; p. 21

GERMANY

Germany, as was shown by Figure 1A on page 20, is the largest producer of nitrogen in the world, when the production of the natural Chilean fields is left out of the picture. Prior to the War, she imported practically half of her requirements, chiefly in the form of nitrate of soda from Chile. Cut off from Chile during the War, she developed her synthetic plants, until today she is the largest synthetic producer in the world.

"The production of fixed nitrogen in Germany has been estimated ... at about 870,000 short tons of contained nitrogen. About 75% of this production is said to be fixed by direct ammonia synthesis and 10% by the cyanamide process; 11% is by-product ammonia. About half of the resulting products is ammonia sulphate, 13% ammonia sulphate-nitrate, 10% cyanamide, 10% calcium nitrate, and 4% synthetic nitrate of soda.

"About 75% of the nitrogen production comes from the Leuna and Oppau works of the German Dye Trust (I. G. Farbenindustrie A. G.) and 10% from the government-owned cyanamide plants at Piesteritz and Trostberg; 11% is by-products from coke and gas plants. The Leunawerke of the I. G. Company is the largest nitrogen fixation plant in the world, having a capacity of 1,800 metric tons of primary nitrogen daily." (141)

(141) Reprinted from the U. S. Bureau of Mines Information Circular 6385, p. 27.

"The German Nitrogen Syndicate, organized in 1919 and renewed in 1930 for a period of seven years, includes the larger nitrogen-producing companies in Germany, the I. G. Farbenindustrie A. G., Ruhrchemie A. G., Gas-Verwertungs-Gesellschaft, and the Scholven Nitrogen Works. The syndicate now represents over a million tons of nitrogen. The I. G. Farbenindustrie A. G. receives an annual sales quota of 750,000 tons of synthetic nitrogen and the Ruhr companies a quota of 251,000 tons. The firms outside the syndicate are reported as not of outstanding importance," according to the Bureau of Mines. (142)

The synthetic nitrogen production of Germany for the year ended June 30, 1928 was 660,000 tons of pure nitrogen; 420,000 tons being consumed in the country, and 240,000 tons exported. The distribution of the production was as follows: (143)

Table XX

German Nitrogen Production, 1928

By-product	60,000 tons
Ammonia Sulphate	310,000 "
Cyanamide	80,000 "
Nitrate of Lime	75,000 "
Nitrate of Soda	25,000 "
Leuna Saltpeter	70,000 "
Urea and Others	<u>40,000 "</u>
	660,000 Tons

(142) Bureau of Mines Info. Circular, p. 27.

(143) Oil, Paint and Drug Reporter; Jl 30, '28; p. 37.

In the latter part of 1929, a gas plant at Leipzig developed a process whereby it was possible to produce a 20% nitrogen fertilizer at a cost which ranged from 60 to 70 marks cheaper than by-product ammonia sulphate. A gas plant producing 10,000,000 cubic meters of gas was said to be able to recover 150 tons of the fertilizer. It was reported that there was a company planning to build a plant capable of producing 25,000 tons per year. (144) (145)

During the period 1929-1931, the nitrogen producing capacity of Germany increased about 20%, in spite of the coming of the world depression. In spite of the increase in capacity, actual production of nitrogen decreased to a marked extent. This decrease was due both to the lessened consumption because of the depression, and to new sources of competition which in this period sprang up all over the world to endeavor to wrest markets away from Germany. Whereas the industry in Germany was operating at full capacity in 1928, it decreased about 10% in 1929---to 90%. This figure dropped down to 68% in 1930, and still further down in 1931---to 45% of capacity. In spite of the cut in production, demand decreased at a still greater rate, as was evidenced by the stocks on hand at the ends of the different nitrate years. These stocks amounted to 300,000 tons of nitrogen at the end of 1929; 500,000 in 1930; and 550,000 at the end of 1931. (146)

(144) Oil, Paint and Drug Reporter; N 11, '29; p. 48.

(145) This was in spite of the efforts of the syndicate to stop further plant constructions in Germany.

(146) Oil, Paint and Drug Reporter; S 12, '32; p. 16.

The comparative condition of the German nitrate industry in 1930 and 1931 is shown as follows: (146)

Table XXI

Production, Sales and Stocks of Nitrates in Germany,
Measured in Metric Tons of Pure Nitrogen.

	1930	1931
Capacity	1,100,000	1,200,000
Production	750,000	550,000
Sales:		
Domestic	360,000	340,000
Export	190,000	180,000
Total	550,000	520,000
Stocks at end of year	500,000	550,000

Of the total German production of 550,000 tons in 1931, the Ruhr District produced 132,000 tons. In spite of the fact that German production taken as a whole declined from 1929 to 1931, the Ruhr production actually increased, because of the opening of several new plants. This was done in spite of the efforts to cut down production capacity. (147)

Synthetic production of nitrate of soda was expected to exceed 200,000 tons in 1932, as almost 150,000 tons were exported during the first six months of the year alone, mostly to France. The output in 1931 was 180,000 tons, and that of the preceding years about 60,000. (148)

(147) Oil, Paint and Drug Reporter; J1 11, '32. p. 52.

(148) Ibid. O 3, '32; p. 51. When speaking of German production of nitrate of soda, one thinks mostly of the I.G. Farbenindustrie A.G., as that company dominates the field.

German PLANTS were increased in 1929 through the building of a factory at Waldenburg, Lower Silesia, by the Prince of Pless interests. The company was capitalized at 8,000,000 marks, and the plant was to have an initial capacity of 15,000 tons of pure nitrogen, produced in the form of ammonia. The plant was one of the first to depend upon waste coke-oven gasses for a cheaper source of hydrogen than could otherwise be obtained. Before the erection of this plant, the Silesian nitrate interests were dependent for their ammonia upon the I. G. Farbenindustrie. (149)

The plant of the Ruhrchemie was in 1930 extended so as to produce 50,000 tons of ammonia annually---the extension taking place with the aid of an American loan that was floated in June of 1929. This plant is another of the installations that use coke-oven gas hydrogen. By using this process, they can produce ammonia more cheaply than can the dye trust with its Haber-Bosch process, even though the latter has the advantages of mass production and the fact that their plants are already amortized. (150)

In November of 1930 another synthetic ammonia plant opened up in the Ruhr Valley, the Gewerkschaft Ewald, using an American process. That made three large plants in the Ruhr, the others being the Ruhrchemie and the Montcenis. This new company planned to increase its capacity in 1932, but the syndicate persuaded it to curtail its plans. (151)

(149) Oil, Paint and Drug Reporter; My 20, '29; p. 51.

(150) Ibid. Ja 13, '30; p. 62.

(151) Ibid. N 10, '30; p. 29.

On December 31, 1930, the I. G. Farbenindustrie decided to close one of the large sulphate of ammonia plants in Westphalia which it had leased a short time previously, thus ending a strife of long standing among the German producers. The reason for the closing was given that the product could be more cheaply produced by the Company's own Haber-Bosch process. Also in 1930, upon the renewal of the nitrogen syndicate, the I. G. took over the production quota of the Mont-Cenis plant. (152)

The state-owned cyanamide works at Presteritz were closed in November of 1931, because of huge stocks of the product that were on hand. The plants were opened again in May of 1932. (153)

In March of 1933, the above-mentioned works at Presteritz were sold to a Bavarian company, which had been leasing them from the government since 1926. The Bavarian company did not plan to use the whole of the plant; part of it was leased to the I. G. Farbenindustrie for the manufacture of fertilizers. The government received the purchase price of the plant in three cash installments. (154) Information as to the details of this transaction were sent to the United States Department of Commerce by the Trade Commissioner stationed at Berlin.

German EXPORTS of sulphate of ammonia during the first nine months of 1928 amounted to 596,972 tons, an

(152) Oil, Paint and Drug Reporter; D 29, '30; p. 48.

(153) Ibid. My 9, '32; p. 51.

(154) Ibid. Mr 13, '33; p. 53.

increase of 25% over the same period in 1927, and an increase of 60% over 1925. This was also an increase of 950% over 1913, when the synthetic industry in Germany was just getting started with its exports. During 1928 there was an increase of 31% in the free trade deliveries of the sulphate, and an increase of only 11% in the reparations deliveries. (155) Destinations of the 1928 exports were as follows, expressed in metric tons: (156)

Table XXII

Destination of German Exports of Sulphate of Ammonia in 1928 (9 mos)

France	139,505 tons
Japan	127,893 "
Holland	112,372 "
Belgium	52,597 "
Spain	41,020 "
Denmark	40,726 "
China	23,305 "

Total German exports of nitrogenous fertilizers in 1928 amounted to \$60,000,000---which represented 1-5 of the total chemical exports. The great reason for the increase of exports in this field in 1928 was the ability of German producers to sell Sulphate of ammonia, which is a highly competitive product, in almost all world markets. Of fertilizers besides sulphate of ammonia, the U. S. was the principal purchaser, taking more than 1-4. (157)

(155) As part of the post-war agreements among powers.

(156) Oil, Paint and Drug Reporter; Ja 21, '29; p. 46.

(157) Ibid. My 6, '29; p. 70.

After the dissolution of the international nitrogen pact on July 1, 1931, Germany, unhampered by restrictions of the agreement, greatly increased her exports of sulphate of ammonia. Total exports for the first ten months of the year amounted to 569,988 metric tons, compared with 436, 252 tons for the same period in the preceding year. That the breaking of the agreement was responsible for the increase in exports was shown by the fact that shortly before its failure, the exports of Germany were 10% below those of 1930. (158) This same increase carried over into the first part of 1932. (159)

German exports of nitrogenous compounds for the first quarter of 1932 showed a tonnage decline of about 10% over 1931, showing that the effect of the breaking of the international syndicate had worn off. During this period, the chief export was nitrate of soda, and not sulphate of ammonia as previously. (160) During 1932 the chief losses of the Germans were in shipments to the Oriental markets and the United States. (161)

During 1932 there was arranged an exchange of German fertilizers and Egyptian cotton. Some 50,000 tons of nitrates were to be exchanged for from 15,000 to 20,000 bales of cotton, the exchange to be on the basis of the price of cotton on the day that delivery took place, while the fertilizers were to be delivered at a fixed price at intervals during the season. (162)

(158) Oil, Paint and Drug Reporter; Ja 4, '32; p. 16.

(159) Ibid. Ap 25, '32; p. 23. (160) Ibid. Je 13, '32; p. 40.

(161) Ibid. N 7, '32; p. 60. (162) Ibid. S 5, '32; p. 51.

Even though Germany has a large annual surplus of nitrates, she IMPORTS annually about 130,000 tons of nitrate of soda from Chile, which substance is preferred for fertilizing the sugar beet crop. (163)

In the first part of 1928, the government of Chile made arrangements to send into Germany up to 150,000 tons of nitrate of soda, which amount it was hoped to sell in the space of a year. These hopes were not realized, partly because of the competition of the synthetic manufacturers, and partly because of the inability of the German farmers to purchase any more fertilizer. Great stocks were left on hand in Germany, involving serious loss to the promoters of the imports. (164)

During the summer of 1931, Germany placed high duties on nitrate imports, and later restricted imports of such materials from Chile. Chile retaliated by giving notice that, effective on October 24, she would end the German-Chilean most-favored-nation treaty of February 1, 1862. Faced with this situation, Germany gave Chile the right to import free of duty enough nitrogen to make the 1931 totals equal those of the year before, and Chile agreed to extend the treaty to December 31, 1931. Later Germany agreed to allow free entry to 48,000 tons of Chilean nitrates up to June 30, 1932, and Chile also agreed to prolong the trade treaty until that date. (165)

(163) Bureau of Mines Information Circular 6385, p. 27.

(164) Oil, Paint and Drug Reporter; J1 30, '28; p. 37.

(165) Ibid. F 8, '32; p. 24.

In 1932, Germany found herself in a terrible predicament as regards prices in world markets. Prices were falling everywhere, and she could ill afford to compete with other countries. She still continued to do so, however, in order to maintain her industrial employment at as high a level as possible. She could not raise home prices to make up for low returns of exports, so the export business of the country was carried on for some time at a loss. That was the main reason for the import tax which she put on nitrates in 1932---she thought that by keeping foreign products out of her own markets, she could keep her home prices from falling to disastrous levels. (166)

GREAT BRITAIN

Production of nitrogen in England is more than enough to supply all the requirements of the entire British Empire---and leave a substantial amount for other uses.(167)

Most of the ammonia produced in the country is of a by-product nature. In 1927, for example, the production of sulphate of ammonia was 399,587 tons, of which 147,162 tons were from gas works, and 252,425 from such other sources as coke ovens and iron works. (168)

In 1930 there was an export agreement between Britain and Germany which favored Britain of sulphate of ammonia and Germany on other forms of fertilizer. (169)

(166) Oil, Paint and Drug Reporter; Ap. 25, '32; p. 23.

(167) Ibid. Ja 27, '30; p.48. (168) Jl 30, '28; p. 37.

(169) Ibid. Ag 18, '30; p. 48.

The following table shows the exports of British Sulphate of ammonia for 1931 and 1932: (170)

Table XXIII

Destinations of British exports of sulphate of ammonia for 1931 and 1932. Expressed in metric tons.

	-----TONS-----	
	1932	1931
British West Indies	18,020	11,456
China	48,832	65,541
Dutch East Indies	12,516	10,376
Italy	39	1,607
Spain and Canaries	194,995	157,955
Other Countries	167,910	121,486

The large amounts shipped to Spain were due to the fact that Imperial Chemical Industries Ltd. received preferred treatment there, being a member of the cartel.

Fertilizer exports for the first nine months of 1932 were 18% above 1931. Those exported were: (171)

Table XXIV

British Fertilizer Exports, 1931 and 1932

	-----Short tons-----	
	1932	1931
Ammonia Sulphate	380,822	315,881
Basic Slag	6,434	12,896
Mfgd. Guano and Compounds	60,014	50,042
Superphosphate	12,140	9,685
	459,410	388,504

(170) Oil, Paint and Drug Reporter; Mr 6, '33; p. 45.

(171) Ibid. D 5, '32; p. 32.

FRANCE

France did not start production of nitric acid until 1928 on a synthetic basis; but by 1930 the total capacity of seven plants in operation had been increased to 50,000 tons. The installations were put up with the idea of using them to make calcium nitrate, and equipment for that purpose was installed in some of the plants. (172)

A French deficiency bill of June, 1930, provided for additional credit of 140,000,000 francs for the development of the government nitrate plant at Toulouse. Of that sum, 50,000,000 was for the expansion of the already-existing plant, and 90,000,000 was for the erection of a nitric acid plant. The bill also provided for government representatives in the management of the plants, in order to keep them in step with government financial plans. (173)

Among other increases in productive capacity in France during 1930 was the plant of La Nitrogene, which was started for the production of calcium nitrate by the gas oven arc process. In the same year, the coal mine owners at Lens completed the fourth unit of their synthetic ammonia plant, bringing their capacity up to 20 metric tons per day. Also during 1930 another company began operating a plant near Rouen for the manufacture of synthetic ammonia by the Claude process, using coke-oven gas. (174)

(172) Oil, Paint and Drug Reporter; Je 16, '30; p. 64.

(173) Ibid. Ag 4, '30; p. 48.

(174) Ibid. O 27, '30; p. 48.

There was a strange situation in the French nitrate industry in 1931, when the domestic consumption was about twice the production. This was brought about by the fact that overproduction in other countries of the world gave French producers a scare; they resolved that they would not get caught with large stocks on their hands. The result was that they did not produce enough to satisfy the home demand. (175)

In 1932 France organized the Comptoir Francais de la Cyanamide de Chaux, capitalized at 200,000 francs. The purpose of the new organization was to develop the cyanamide industry, and to find new markets. (176)

During 1933 France planned to increase production at the government plants at Toulouse, in order to reduce the unit cost of production. From a capacity of 40,000 metric tons per year, an expanded production was planned to include 80,000 tons of sulphate of ammonia, 80,000 tons of nitrate of soda, and 80,000 tons of "ammonitre". (177)

Also in 1933 France planned to spend 60,000,000 francs in order to make herself independent in nitric acid. She planned to build plants and lease them to private concerns. She planned to spend 42,000,000 for the construction of plants; 15,000,000 for shipping and storage of ammonia; and 3,000,000 for nitric acid shipping equipment. (178)

(175) Oil, Paint and Drug Reporter; Mr 16, '31; p. 42.

(176) Ibid. S 26, '32; p. 51.

(177) Ibid. F 27, '33; p. 40.

(178) Ibid. F 27, '33; p. 15.

By a decree of May 5, 1931, France set up an import license system, both to protect local producers and as a means of national defense. At the very first, licenses were issued for the import of 50,000 tons of nitrate of soda; and later it was announced that further licenses to sell imported nitrates in France would be given only if the importers agreed to maintain certain stocks in France as a military precaution, to reduce the price, and pay a large license fee---which fee was to be used to subsidize the synthetic industry in France. A further reason for the new law was that there was a deficit in the commercial balance, and more ready money was needed. (179)

The decree established a commission to regulate imports, the committee being made up of both the manufacturing and the agricultural interests of the country. As first inaugurated, the manufacturers had the majority control, but during the latter part of 1932 the control went the other way, with the agriculturists in power. This group was more lenient to importers, as it was to their advantage to have more imports and lower prices. (180)

American, Norwegian and Chilean producers protested against the provisions of the licensing system, refusing to agree---with the result that the law was modified to some degree. (181)

(179) Oil, Paint and Drug Reporter; N 30, '31; p. 17
Ja 4, '32; p. 17.

(180) Ibid. N 21, '32; p. 15.

(181) Ibid. N 30, '31p. 17.

In October, 1932, a pact was signed between France and Chile whereby the former country would get the latter's nitrate in exchange for some of her credits that were frozen in Chile. That is, 40% of the duty that was to be charged on whatever allotment fell to Chile, was to be paid by Chile in pesos---the credits that were frozen in Chile. The transaction would therefore have the nature of a bookkeeping entry. (182)

A special provision in the French budget law enabled the authorities to impose special fees during 1933 for all import licenses covering products subject to quota, and to fix the maximum selling prices for those products. Merely another way to cut down imports diplomatically. (183)

JAPAN

In 1929 a syndicate of several firms agreed to purchase from the government the right of making ammonia by the Haber-Bosch process. Thus the Tokyo Nitrogen Corporation was formed. This corporation never actually manufactured nitrogen, but collected a royalty of 2% on all imports of Haber-Bosch sulphate of ammonia into Japan. The company had to pay the government 500,000 yen per year to encourage research. When in 1932 it refused to pay more than 300,000, the government took away all royalties on imports not exceeding 50,000 tons per year. (184)

(182) Oil, Paint and Drug Reporter; O 31, '32; p. 54.

(183) Ibid. Mr 13, '33; p. 22.

(184) Ibid. N 26, '28; p. 48....S 5, '32; p. 51.

Finally, in 1932, the government took away the patent from the corporation. (185)

In September of 1931, the Miike Nitrogen Ltd., capitalized at 10,000,000 yen, started manufacturing sulphate of ammonia by the Claude process. The ultimate capacity of their plants was 90,000 tons per year. The company had bought out these patent rights from another Japanese company four year previously. They were to sell their product through the company which controlled the sales of British and German sulphate of ammonia on the Japanese market, and also the sales of four other Japanese firms, the Mitsui Bussan Kaisha. (186)

A permit was also granted the South Manchurian Railway for the establishment of a sulphate of ammonia plant at Dairen, to begin operations about the middle of 1933. The capital was to be 25,000,000 yen---half to be subscribed by the railway, and the other half offered to the general public. Capacity was to be 180,000 tons per year, but operations were to be started on a basis of only 90,000 tons per year. (187)

In June of 1933 there was a 5,000,000 yen company launched for the production of sulphate of ammonia by the Haber process, with an annual capacity of 50,000 tons. (188)

(185) Oil, Paint and Drug Reporter; Ap 3, '33; p. 57.

(186) Ibid. S 7, '31; p. 45.

(187) Ibid. Ja 23, '33; p. 20.

(188) Ibid. Je 12, '33; p. 18.

In June of 1933 there was formed a company known as the Oriental High Pressure Industry Company, for the manufacture of sulphate of ammonia by the Claude process, with an annual capacity of 120,000 tons. It was expected to take at least a year, and perhaps much longer, before the new plant would be in production. Other Japanese manufacturers of sulphate of ammonia were at the same time planning to increase their capacities, the total projected change being from 240,000 tons to 480,000 tons. (189)

Japanese production of sulphate of ammonia during 1932 amounted to 684,000 tons, an increase of 82,000 tons over 1931, according to word from the Department of Commerce at Washington. In spite of the increase, the output was far short of the estimates of 800,000 tons. Nevertheless, the estimates for 1933 were set still higher, at 900,000 tons. (190)

In July of 1933, there was organized in Japan by six producing companies, a sulphate of ammonia production and sales syndicate. Importers agreed to support it, although they did not join. Members had to control production and prices, those selling below a certain price being fined. Amounts of all sales had to be reported to the syndicate, which became operative on July 1. All rules were to be subject to the approval of a general meeting of the adherents to the pact. (191)

(189) Oil, Paint and Drug Reporter; Je 5, '33; p. 61.

(190) Ibid. My 22, '33; p. 44.

(191) Ibid. S 5, '32; p. 51.

In the latter part of 1930, Japan began to be a power in the export field for sulphate of ammonia, showing up first in Java. The German, British and Dutch producers had gotten the Javanese market all fixed up between themselves, with quotas and prices set---when along came the Japanese quoting prices about 10% below those set by the Europeans. Considerable tonnage was gotten in this attempt, orders being taken for delivery throughout 1931 and 1932. (192)

Japan later got such a good foothold in the Dutch East Indies that of total bookings for forward delivery during the first half of 1933, 80% were estimated to have been gotten by the Japs. (193)

Japan is for the most part an IMPORTER of sulphate of ammonia.

In November of 1931, in order to better regulate the quantity of the material coming into the country, an import licensing system was established. (194) In order to get an import license, one had to give information as to quantities, time of shipment and time of import. Similar information was also required of all who desired to export Japanese sulphate of ammonia. At the same time it was made obligatory for all producers inside the country to make periodic reports as to their monthly output. (195)

The licensing system was revoked in the latter part of

(192) Oil, Paint and Drug Reporter; Ja 5, '31; p. 41.

(193) Ibid. N 28, '32; p. 41.

(194) Ibid. N 16, '31; p. 57.

(195) Ibid. F 1, '32; p. 61.

1932, and Japan ceased selling any sulphate of ammonia in foreign countries. She then became strictly an importer, and a relatively heavy one, at that. With the dropping of the license system, she jacked the home market price up from 65 to 90 yen per ton. (196)

In March of 1933 there was felt in Japan an acute shortage of sulphate of ammonia, with the result that an importing company planned to take in 25,000 tons during April and May. 12,000 tons were to go to Japan proper; 5,000 tons were to be sent to Korea; and 8,000 tons into Formosa. (197)

BELGIUM

This little country, when its size is taken into consideration, is a heavy exporter of nitrogenous fertilizer materials. Table XXV shows the exports for the first nine months of the years in question of the principal product, sulphate of ammonia: (198)

Table XXV

<u>Belgian Exports of Sulphate of Ammonia in 1931, 1930</u>		
	<u>-----Tons-----</u>	
<u>Destinations</u>	<u>1931</u>	<u>1930</u>
France	6,795	14,542
Germany	31,677	3,713
Netherlands	13,599	4,530
Spain	14,247	8,134
United States	17,968	5,742
Other countries	<u>18,245</u>	<u>21,744</u>
	102,531	58,405

Footnotes on next page.

Although a heavy exporter, Belgium is also a substantial importer of sulphate of ammonia, as is shown by Table XXVI. An item worthy of note in comparing Tables XXV and XXVI is that Belgium receives more than she sends to both Germany and Holland, for the most part. (198)

Table XXVI

Belgian Imports of Sulphate of Ammonia for first
nine months of 1931 and 1930

Sources	-----Tons-----	
	1931	1930
Germany	19,418	28,631
Netherlands	35,351	6,065
Saar Basin	566	327
Other countries	<u>9,137</u>	<u>12</u>
	64,472	35,035

In April of 1932, the Belgian and German producers tried to bring about some sort of an agreement whereby the production and sale of sulphate of ammonia could be regulated. It was agreed by producers of both countries that some of the plants would have to close down. The trouble was then that the Germans wanted to completely close all Belgian plants, paying the Belgian owners an indemnity. This plan did not appeal to the Belgians, who thought that some plants should be closed in each country. Each one was afraid to let the other get the jump on her, watching out for her own interests. (199)

(196) Oil, Paint and Drug Reporter; D 12, '32; p. 51.

(197) Ibid. Ap 3, '33; p. 57.

(198) Ibid. Je 26, '33; p. 23.

(199) Ibid. Je 6, '32; p. 34.

There were many different plants and processes for the production of nitrogen in Belgium, and there was little unity of methods among the producers. In order to achieve some degree of standardization of technique in the industry, there was formed in September of 1932 the Federation Belge de Producteurs d'Azote, made up of the leading producers of nitrogen in the country. (200)

NETHERLANDS

In July of 1928, the Parliament of the Netherlands approved an increase of \$1,000,000 in the budget of the state-owned coal mines, for the purpose of the erection in conjunction with the mines of a plant for the production of synthetic ammonia. The ammonia was to be used to supply fertilizers to the Netherlands and its colonies. Although an appropriation of only \$1,000,000 was made at that time, the ultimate cost of the installation was placed at \$5,000,000. (201)

The first artificial fertilizer plant to actually go into production in the country was one erected by a steel plant, securing its hydrogen from the coke-oven gas of the plant. Actual operation was expected to begin in October of 1929. Although built by the steel plant, a separate company was formed to manage the new works, and rumor had it that it was controlled by the Royal Dutch Shell, who possessed important patents. (202)

(200) Oil, Paint and Drug Reporter; S 26, '32; p. 51.

(201) Ibid. J1 9, '28; p. 54.

(202) Ibid. O 1, '28; p. 49.

In October of 1931, it was estimated that the productive capacity of the nitrogen plants in the Netherlands amounted to 75,000 tons of pure nitrogen, which amount was equal to 85% of the total domestic requirements. Sulphate of ammonia was practically the only substance of which there was any appreciable surplus. (203)

Exports of sulphate of ammonia from the Netherlands increased from 254,685 metric tons in 1931 to 377,022 tons in 1932, the United States taking about one-half in the latter year. Table XXVII shows the destinations of exports in 1932: (204)

Table XXVII

<u>Netherlands Exports of Ammonia Sulphate in 1932</u>	
<u>Destinations</u>	<u>Tons (metric)</u>
Belgium and Luxembourg	23,885
Canada	4,714
Central America and West Indies	33,601
China	2,931
Denmark	1,525
Dutch Indies	27,396
Great Britain	1,037
Hongkong	3,708
Oceania	5,500
Philippine Islands	4,177
Spain and Portugal	76,391
United States	187,907
Sweden	875

(203) Oil, Paint and Drug Reporter; O 19, '31; p. 26.

(204) Ibid. F 27, '33; p. 40.

In 1929 there was established in the Netherlands an agency for the purchasing of Chilean nitrate of soda for the coöperative agricultural societies. The agency was known as the International Coöperative Agricultural Purchasing Association, and was affiliated with the Coöperative Purchasing Association Central Bureau of the Netherlands Agricultural Committee. The Central Bureau in 1929 comprised about 780 societies, representing 70,000 farmers in the country. In that year, the purchases of Chilean nitrate of soda by the Central Bureau were 86,459 tons. Total expenditures for foreign fertilizers during the year amounted to 19,902,832 florins. (205)

POLAND

Under the terms of a decree of July 22, 1931, Poland prohibited the importation of the following products except under authorization from the Ministry of Commerce: ammonia nitrate, ammonia sulphate, Chile saltpeter, sodium nitrate from other sources, calcium cyanamide, and all compounds. (206) This was done to bolster up the home industry, which was in a weak condition.

The Polish industry and the intermediate credit institutions were afraid to grant liberal credit to farmers. To help the industry, the government set up a fund of about \$673,000, which it used to guarantee payment on such sales up to 15%, payment to be made after a year, when it was definitely seen that the debts were uncollectible. (207)

(205) Oil, Paint and Drug Reporter; J1 8, '29; p. 48.
 (206) Ibid. Ag 3, '31; p. 54.
 (207) Ibid. My 30, '32; p. 12.

NORWAY

While a great producer of artificial fertilizers, Norway has the markets of Europe closed to her, due to an agreement made in 1927 with the I. G. Farbenindustrie, whereby the Norsk Hydro was to have the home market, and the outside markets were to be left to the I. G. (208)

Norway is chiefly of interest in this report because of a new process which was discovered there in 1932 for the making of nitrate of soda from seawater. The process is believed to be based upon the extraction of sodium carbonate or some other sodium compound from seawater, thus doing away with the need of importing soda ash. The Norsk Hydro put the new process into operation in its nitrate plant at Heroya. (209)

RUSSIA

Little is known about the fertilizer business in Russia. Because of its great needs at home, its products seldom come upon the marts of international trade, and thus do not figure in import and export statistics. Russia is treated here not because it is necessarily an important producer of nitrates, but rather because it furnishes an interesting problem---a fitting way to end this discussion of the current world situation in the field.

(208) Oil, Paint and Drug Reporter; F 6, '28; p. 63.

(209) Ibid. N 14, '32; p. 52.

In February of 1929, the Soviet Government ratified a contract calling for the technical assistance of an American engineering company in the construction and operation of a \$10,000,000 factory for the production of synthetic ammonia fertilizers. (210)

"Commenting on the Five-year Plan of the nitrate industry of Soviet Russia, the official organ of the chemical industry of Russia writes that the plan in its fundamentals has not yet been approved by the government, owing to the fact that the main problems of the plan which have been under discussion for the last three years have not been decided upon, and they are still open for discussion. The governing problems are: 1. Distribution of the nitrate industry; 2. Location of raw materials; 3. Methods of production; 4. Products to be produced.

"The problem of geographic distribution and geographic location is rather complicated by the vast and extensive distances in the country. The consuming markets are scattered all over the country and are at great distances from the points at which raw materials are to be had. Scarcity of waterways and poor navigability of rivers make it difficult to solve the problem of transportation, and points which are favorable for the production of fertilizers are in Russia as a rule poor consuming markets. Another difficult problem for Russia is the distribution of energy,

(210) Oil, Paint and Drug Reporter; Mr 18, '29; p. 45.

which is rather to the disadvantage to the sources of fertilizer raw materials; of definite value is the supply of water.

Coal is the largest source of energy in Russia, and 95% of Russia's wealth of coal is to be found in three regions, which are at a distance of 2,500 miles from one another. These regions are the Kuznetz Basin, holding 70% of the resources; the Don Basin holding 14%; and the Irkutsk holding 11%. The potential coal resources of Russia are estimated at 85% in the Caucasus, 10% in Siberia, and 4% in Sakhalin. In other words, the fuel resources of Soviet Russia are mainly in the Asiatic part, in Siberia. 85% of the power resources of the country are distributed over an area with a population of less than 20,000,000 people, largely tribal. The area is nearly five times the size of European Russia, has a meager agricultural cultivation, and makes therefore a poor market for fertilizers.

The heavy metallurgical industries which are the basic sources of raw materials for the production of nitrogen, are located adversely to the coal supply. 96% of the heavy metallurgical industries are to be found in European Russia, namely, in the industrial Ukraine, the central districts of Russia, and the region of Leningrad; while Asiatic Russia beyond the Ural mountains contains only 4%.

It is evident that, from the point of view of the proximity of the supply of fuel and energy to the location of the raw material sources, the situation in Russia is not

favorable. Another handicap is the problem of labor supply and the intercommunication with other industries.

Siberia and the Urals, both of which are rich in sub-soil resources, as well as in the supply of energy, which are vital for the development of a nitrogen industry, are poor markets for nitrogen fertilizers. They participate with only 8% of the country's total requirements; while the western regions of Russia, the central black-soil plateau, the industrial districts of central Russia, the Ukraine, White Russia, Leningrad, and the North and Transcaucasus make up the bulk consumption of fertilizers of the country. These regions are at the same time much behind the Urals and Siberia in a position to produce fertilizers.

Converted into ammonia equivalent, the requirements represent a total of 550,000 tons in 1933; 1,110,000 tons in 1935; and 2,220,000 tons in 1938.

The above listed regions consume about 84% of the total fertilizer requirements of the country. It must be borne in mind that to supply these regions with nitrogen fertilizers from the main producing points of the Urals and Siberia does not seem to be advantageous, owing to the high cost of transportation. Considering, on one hand, the cost of transportation of raw materials to the point of consumption where the plant should be erected plus the cost of production of the fertilizer, and on the other hand the cost of transportation of the fertilizer produced at the more favorable point of production, that is, at the source

of its raw materials, there would be a balance in favor of the location of the production of fertilizers near the source of energy and of sulphuric acid in preference to the erection of plants near the points of consumption. At the latter points, the cost of production will be much higher because of the long hauls of raw materials, coal and sulphuric acid.

...Further suggestions are made of points suitable for fertilizer plants because of their wealth of cheap water power. These are the regions of Moscow and some places in central Asia and the Caucasus.

It is to be expected that within the second Five-year Plan consideration will also be given to Siberia with its future hydraulic power stations on the Angara, or some other water-power installations which are planned elsewhere in the Urals and on the Volga River. It must, however, be borne in mind that these regions are very poor farming districts and are small consumers of fertilizers, and therefore, it will be necessary to erect about 50% of the nitrogen plant capacities in regions which possess less than 25% of the water-power resources combined in the Urals. Owing to reasons of national defense, which tend to shift the central point of the industries of Soviet Russia eastward, the border states of Kasakstan, Uzbekstan and Dages-tan will each see the erection of a fertilizer plant within its borders.

The present nitrogen fertilizer plants of Russia are

mostly operated on hydrogen from coke ovens. While it remains to decide on the future methods of production in Russia, it is evident that preference will be given to the Linde-Casale Process, and there is already a noticeable tendency today to increase and develop the coke industry in keeping with the demands and requirements of the fertilizer industry." (211)

SUMMARY---THE FUTURE

The most significant change in the industry in the recent past has been the transition from natural to artificial nitrates for the bulk of the commerce of the world. With this transition has a concentrating of the production of nitrates in the hands of the big powers. With this concentration, and the desire of each nation to outdo its neighbors and to become as self-sufficient as possible, there has resulted a dire period of over-production and disastrously low prices---a period which the industry is still in the midst of. These troubles have been aggravated by the economic depression which the entire world has passed through.

As for the future, I expect that the production of nitrates will follow still more of a nationalistic course than it pursues at present. Practically all nations have industries the waste products of which could well be made into valuable nitrogenous fertilizers, and it is only reasonable to expect that they will be developed.

This nationalization of nitrate production will be but another part of the great struggle of today, when each country is trying to make all that it possible can for itself, and thus avoid importing---in order to keep up employment levels in the home countries. With the pulling of the world out of the present depression, it is very probable that this procedure will give way to one where different goods will be manufactured by the nations best fitted by location and natural resources for such manufacture. However, I do not think that nitrates will ever again be closely concentrated in few countries, such as was formerly the case in Chile and Perú. Nitrates are vitally necessary for so many things besides fertilizers and war supplies, and almost every country (as has been mentioned above) has industries whose by-products could be used for their manufacture---therefore I believe that they will continue to be produced in all industrialized nations of the world.

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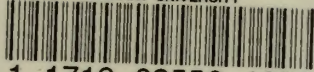
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